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PROMOTING ENVIRONMENTAL QUALITY THROUGH URBAN PLANNING AND CONTROLS

NORTH CAROLINA UNIVERSITY

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PROMOTING ENVIRONMENTAL QUALITY THROUGH URBAN PLANNING AND CONTROLS

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FORWARD BY THE ENVIRONMENTAL STUDIES DIVISION
OFFICE OF RESEARCH AND MONITORING, ENVIRONMENTAL PROTECTION AGENCY

"Of all the factors that determine the quality of our environment, the most fundamental is the use we make of our land."

--Citizen's Advisory Committee on
Environmental Quality, 1972 Report

Until very recently, the land use patterns in many areas of this country evolved with a minimum of governmental control. We are coming to realize that our ability to deal with the symptoms of today's environmental crises is shackled by yesterday's land use practices. For example, the urban sprawl which evolved in the Los Angeles area is apparently complicating efforts to control air pollution.

In the hope that today's land use plans and activities will not add to the environmental problems caused by previous efforts, the Environmental Studies Division, Office of Research and Monitoring, Environmental Protection Agency is initiating research into the relationship between land use and environmental quality. The purpose of this effort is to improve the methodologies available to decisionmakers involved in land use issues. Part of this effort has resulted in the following report, one of a series of research reports devoted to improving the "environmental sensitivity" of the decision-making and comprehensive-planning process.

Current planning and land use decision-making techniques will be assessed in this series to determine their sensitivity to environmental concerns. Existing research will be analyzed to determine its relevance to environmental-land use issues and to help avoid duplication of research. This effort will include conceptualizing the notion of environmental carrying capacity and developing policy, planning, and decision-making tools, methods and techniques which are effective in meeting new environmental goals and objectives. By providing the necessary understanding and capability to policymakers, planners and others, environmental problems can be dealt with before they become crises.

An approach to land utilization is needed which takes into account the capability of the total environment to accommodate and absorb the results stemming from various land use pressures. This systematic and interdisciplinary approach must be developed for, and communicated to, those policy planning and decision-making processes which impact all aspects of the environment.

ABSTRACT

This study focuses on the changing awareness and current practices in promoting environmental quality through urban planning and controls in local and metropolitan planning agencies. To provide perspective for understanding the current scene, it reviews the mainstream and cutting edge practices and orientations of the 1960's in the following sectors of planning activity related to environmental quality: comprehensive planning; planning for urban spatial structure (land use, open space, and transportation); urban design (urban renewal and planning for esthetic objectives); and urban environmental management (air, water and noise). It indicates that planners during that period reflected society as a whole and were little concerned with environmental quality as related to natural systems.

In order to establish the current mainstream practices and orientation, a national survey of urban and regional planning agencies was conducted. The findings indicate that environmental awareness in such agencies followed rather than led national environmental awareness through the 1960's. There is indication of considerable current environmental concern but of only modest planning and implementation activity with indirect introduction of environmental goals into a broad range of traditional urban planning concerns. Local government is currently the weak link in the intergovernmental environmental policy framework mainly because it lacks technical capacity and is underutilized by higher levels of government. However, the findings suggest that local governments do have a strong sense of responsibility and would respond positively to further encouragement of greater participation in environmental planning.

The study then reviews the more promising and innovative approaches that form the cutting edge of awareness and practice in four sectors of planning activity that are related to environmental quality: land use and comprehensive planning, planning and controls for the water resources-land use interface; urban design and controls; and residuals management (limited to noise and air quality). In each sector, a number

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of promising planning and action approaches are integrated into a coherent perspective of the cutting edge. A guidance system concept, consisting of planning activity, decision guides, and action instruments, is used as the integrating framework.

Based on the review of mainstream and cutting edge practices and attitudes, the summary chapter integrates recommendations within a proposed guidance system approach for local and metropolitan agencies.

CONTENTS

Page

Foreward iii

Abstract v

Part I. Introduction

Chapter

1. Scope and Conceptual Framework 5

2. Organization of the Report 17

Part II. Changing Awareness and Practice

3. Perspectives of the 60's 25

4. The Current Scene in Local and Metropolitan Planning Agencies 47

Part III. Promising Approaches

5. Land Use Planning: The Cornerstone of Local Environmental Planning and Control 95

6. Water Resource Management: Planning and Control Systems for the Water-Land Use Interface 173

7. Urban Design: Managing the Visual Quality of the Urban Environment 281

8. Planning and Residuals Management: Noise and Air Quality 345

Part IV. Summary and Recommendations

9. Summary 403

Acknowledgements 433

References 435

Appendix 465

FIGURES

No.		Page
1-1	Environmental Guidance System	10
1-2	Framework to Guide the Study of Urban Planning and Controls for Promoting Environmental Quality	12
5-1	The Integration of Natural Processes into an Ecosystem	113
5-2	Land Use Guidance System Planning Process	122
5-3	Data in Bucks County Computerized Guidance System	133
6-1	Water Quality Interchanges	174
6-2	Flood Damage Prevention	206
6-3	Relationship Between Zoning Districts and Floodland Regulations	209
6-4	Implementation and Financial Assistance for Flood Damage Prevention Programs	210
6-5	Floodplain Regulations	214
6-6	Water Quality Management System	221
6-7	Storm Water Management System	234
6-8	Water Resource Management Measures	253
6-9	Legal Basis and Administrative Agency for Selected Water Use Management Measures	255
7-1	Urban Design Activities and Their Influences on Visual Quality	286
7-2	Process Oriented Urban Design	300

TABLES

No.		Page
4-1	The Stratified Random Sample Design and the Distribution of Responses	52
4-2	Distribution of Usable Responses by EPA Region and Planning Agency Sampling Strata	54
4-3	Views of the Meaning of Environmental Planning, by Agency Type	58
4-4	Importance of Environmental Problems in the Agency's Jurisdiction	60
4-5	Percentages of Agencies Having Environmental Planning as a Separate Work Activity, by Type of Agency	61
4-6	Proportion of Agencies Engaged in Various Program Areas and the Assessment of Importance of Environment Quality Goal to the Program	63
4-7	Number of Agencies Having Personnel Trained in Environmental Fields	65
4-8	Regulatory Tools Listed in Order of Effectiveness in Achieving Environmental Quality	67
4-9	Incentives, Capital Investments, Information/Advice Tools Listed in Order of Effectiveness in Achieving Environmental Quality	71
4-10	Percentages of Agencies Using Specific Information and Studies in Determining Regulatory Instruments	73
4-11	Percentages of Agencies Using Specific Information and Studies in Determining Capital Investments and Incentives	76
4-12	Most Important Influences in Raising Environmental Issues	78
4-13	Relative Impact of Various Factors on Implementation of Agency's Recommendations for Achieving Environmental Quality	79

4-14 Responses about Federal Legislation, Agencies and Programs Having a Significant Effect at the Local and Metropolitan Level 83

4-15 Suggestions for Changing Intergovernmental Framework 85

4-16 Distribution of Responses About Local Government's Role in Relationship to Higher Levels of Governments 87

4-17 Distribution of Responses about Local Government's Role in Terms of Specific Aspects of Planning and Implementation Processes 89

5-1 Important Relationships of Geology and Urban Development 109

8-1 HUD Noise Standards for Locations Near Airports 358

8-2 Estimated Emissions of Air Pollutants by Weight, Nationwide, 1970 (Preliminary Data) 369

8-3 National Primary and Secondary Air Quality Standards 371

PART I

INTRODUCTION

CHAPTER I

SCOPE AND CONCEPTUAL FRAMEWORK

Page

The Research Approach and Objectives 6

Defining the Urban Environment and the Environmental Quality Dimensions for the Study 8

The Environmental Guidance System at the Local Level 9

The Urbanization System at the Local Level 13

Preceding page blank

CHAPTER I

SCOPE AND CONCEPTUAL FRAMEWORK

The environmental consciousness which evolved in the United States during the 1960's is now beginning to crystallize into a true societal commitment to the achievement of environmental quality. Reflecting on the state of the environment and the national commitment to it, the Citizens' Advisory Committee on Environmental Quality reported in 1972:[1]

> There is much to be encouraged about. Over the last few years, the Federal Government has taken some important steps. In early 1970 the Council on Environmental Quality (CEQ) was established, and later in the year the Environmental Protection Agency (EPA). Both of these agencies have already accomplished much...and there has been a substantial increase in the amount of Federal appropriations for environmental programs. The National Environmental Policy Act (NEPA) has placed environmental considerations on a par with other factors in the formulation and administration of Federal programs. Concern for the environment has been incorporated into an enormous range of decisions--decisions by individuals, by corporations, by legislatures, and by courts.

Furthermore, largely spurred by federal legislation and citizen concern, every state has initiated some action to protect environmental quality.[2]

While all these indications of commitment at the federal and state levels are encouraging and necessary components of a societal commitment to our planet, they are not sufficient. Elsewhere in the same report, the Citizens' Advisory Committee points out that urbanization with its concomitant maze of decisions affecting the use, development, maintenance, and redevelopment of land is perhaps the most important determinant of environmental quality, particularly the quality of the

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urban environment where the vast majority of our citizens live.[3] Most of these decisions are made at the local level, influenced by local public investments, regulative ordinances, and economic incentive devices. The effective participation of local urban government is crucial, but now its role is weak, underutilized and poorly understood. Without both a concern for and a capacity to incorporate environmental goals at the local and regional levels within states, a major portion of public policy and its influence on urbanization decisions will be void of purposeful, systematic, and explicit concern for environmental quality.

There is a need to better understand this critical link in our societal commitment to environmental quality; to be aware of some of the more promising efforts to incorporate environmental quality goals in urban planning at the local level, and to suggest ways and means for improvement. This need is recognized by diverse groups: federal bureaucrats and legislators who carry the responsibility for environmental policy at the national level and who want to improve their understanding of local planning and development controls to be more effective in influencing urbanization decisions; local officials and professionals, who feel limited in their technical understanding of the environmental problem and who are seeking more information about proven or even promising environmental planning ideas; and environmental engineers and designers at all levels of government, who have traditionally approached problems with technical solutions, but who are now realizing the need to understand the more indirect impacts of their technical solutions. It is for all of these groups, with their need to understand the current fact and potential promise of local urban environmental planning and guidance, that this study has been conducted.

The Research Approach and Objectives

Since there is a certain amount of disparity between predominant practice and the more rarely found examples of more innovative practices and conceptual advancement, it is useful to distinguish the mainstream from the cutting edge. The collective activity of hundreds of municipal, metropolitan, regional, and state planning agencies comprises the mainstream of the planning profession. In addition, numerous consulting firms have sprung up, mostly in the mainstream, to provide planning capabilities to governmental agencies. Comprehensive planning and its component sectoral studies (land use, transportation, housing, open space, waste management, public facilities and services, and civic appearance) have formed the substance of this mainstream at the local level of government. Making up the cutting edge level of planning practice and consciousness are a few agencies, academicians, larger and more innovative consulting firms, special institutes and foundations, some federal officials, and some federal legislation.

In distinguishing mainstream from cutting edge professional planning practices for this study, we found it desirable to adopt an unusual criteria for the latter. Within that category we were attempting to identify unique and promising approaches. Hence the cutting edge includes those practices which are promising and have, in addition: (1) recently emerged as an idea and are being used by only a few agencies; (2) ideas which are old but which are applied by a few agencies; and (3) concepts which are old but are only beginning to be put into practice in the field.

The exchange of information between the two levels is fundamental to the evolution of the planning field over time. Practices and ideas at the cutting edge in the sixties (ecological studies and aesthetic controls for example) are much closer to the mainstream of the seventies. Along with traditional ideas, the cutting edge of the sixties has, in fact, helped to carve out what is now the mainstream.

The objectives of the study are to answer the following three research questions about urban planning agencies at the local and metropolitan levels of government:

1. What is the mainstream or more predominant state of environmental awareness and practice which characterizes most general planning agencies?

2. What, in contrast to the mainstream, are the more innovative and promising approaches that form the cutting edge of urban environmental planning and control?

3. Based on a summary of findings to the first two questions, what recommendations can be suggested for urban environmental planning and control?

These questions clearly focus on the most poorly understood and underutilized link in the urban environmental policy chain--the local environmental planning and control system. Ideally, the environmental policy chain should integrate national concern and federal and state policy with the urbanization decisions of individual firms, households, and local governments. We have found in this study, however, that most planning for environmental quality at the local and metropolitan levels of government, including the approaches we consider to be at the cutting edge, is currently being attempted without much intergovernmental cooperation. Nevertheless, we also consider state and federal planning and policies as important factors in the framework for local planning and guidance.

Defining the Urban Environment and the Environmental Quality Dimensions for the Study

The scope of this study is limited to the environment of the urban regions of the United States. We recognize that urbanization is the driving force of environmental pollution wherever it occurs, even in rural areas far removed from a city. We realize also that the urban system is dependent on energy resource extraction and other environmental processes, for an energy circuit or nutrient circuit begins and ends with the non-urban environment. This study, however, is limited to the environment of the urban place itself, not including the serious but further removed problems of urbanization such as resort development or resource extraction.

The urban environmental system consists of natural elements (water, land, air, living organisms) and natural processes (energy and nutrient flows) in an urban ecosystem; manmade urban elements (urban land uses, transportation systems, water supply and sewerage systems, production and consumption systems); and very importantly, man himself. It is only through this three-part system that environmental quality can be affected by public policy.

The quality dimensions of the urban environment are related to the environmental goals of safety, health, amenities, aesthetics, and conservation of cultural and natural resources, including natural processes, all of which contribute to the "safe, healthful, productive, and aesthetically and culturally pleasing surroundings" called for in Section 101 (b) of the Environmental Policy Act of 1969.

While the scope of environmental systems is limited to urban place systems, the range of the quality dimensions within the systems is broad, including several anti-pollution goals which characterize EPA's current focus on the problems of air quality, water quality, and noise management. However, radiation and pesticides, two other specific concerns of EPA, are not predominantly urban problems and therefore are not covered in the report. Ecological goals concerning natural resources within urban regions, energy flows, nutrient cycles, hydrologic cycles, ecosystem diversity and stability and other natural processes are included. The conservation of cultural resources in natural and manmade environments is also included as an aspect of environmental quality as is the concern for the amenities and aesthetic qualities of the developing urban environment. Lastly, the renewal of urban manmade and natural environments is considered an activity within the scope of environmental quality concerns.

The Environmental Guidance System at the Local Level

At the federal level, the Environmental Policy Act implies an emphasis on implementation through the planning process. At the more local levels, it is not sufficient to examine only the activities of

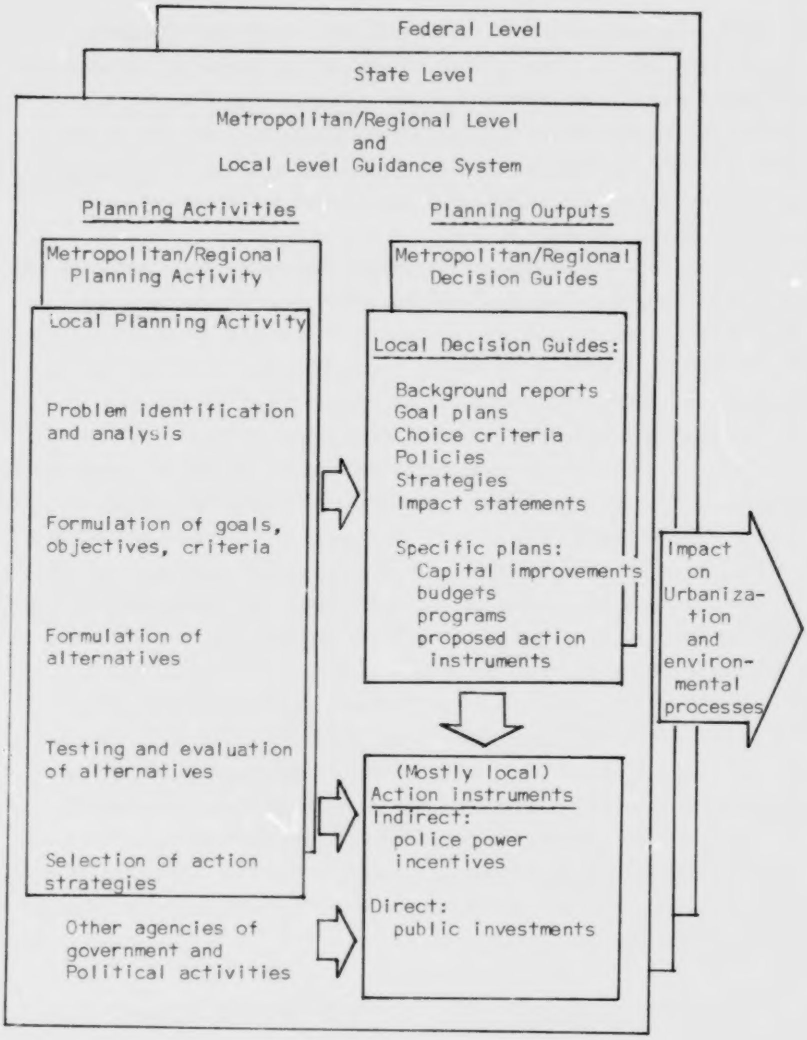
Federal Level
State Level
Metropolitan/Regional Level and Local Level Guidance System
Planning Activities
Planning Outputs
Metropolitan/Regional Planning Activity
Local Planning Activity
Problem identification and analysis
Formulation of goals, objectives, criteria
Formulation of alternatives
Testing and evaluation of alternatives
Selection of action strategies
Metropolitan/Regional Decision Guides
Local Decision Guides:
Background reports
Goal plans
Choice criteria
Policies
Strategies
Impact statements
Specific plans:
Capital improvements
budgets
programs
proposed action instruments
(Mostly local) Action instruments
Indirect:
police power
incentives
Direct:
public investments
Other agencies of government and Political activities
Impact on Urbanization and environmental processes

FIGURE I-I

ENVIRONMENTAL GUIDANCE SYSTEM

planning inquiry into goals and objectives, or even the resulting plans. The impact of local level plans and planning activity on environmental decisions is indirect at best. It is therefore essential to examine governmental activities which influence urbanization and environmental decisions more directly--public investments in utilities, transportation, community facilities, housing, renewal, industrial parks, and acquisition of open space; regulative instruments such as zoning and subdivision controls, housing and health codes, burning and other nuisance laws; and incentives sometimes incorporated in taxation, annexation, and utility extension policies.

Figure I-I diagrams the local level environmental guidance system to be examined in this study. It is composed of a series of successive planning inquiry stages and corresponding outputs. The planning activities include problem identification and analysis; formulation of goals, objectives, and decision criteria; formulation of alternatives; testing and evaluation of alternatives; and selection of action strategies. The corresponding outputs of these activities by which planning is implemented include a variety of decision guides and action instruments:

> Decision Guides--background studies, goal plans, program plans, policy statements, budgets and capital improvement programs, and environmental impact statements.
>
> Action Instruments--public actions which impact directly on the environment (public investments such as waste water treatment plants) or those which impact indirectly by creating boundary conditions within which urbanization proceeds (zoning or tax policies).

In this guidance system concept, the action instruments comprise the core of local governments' actual operations. Planning inquiry activities, decision guides, political activities, and the work of other local agencies are major inputs. Planning activities are addressed to both formulation of various decision guides and development and implementation of various action instruments. Decision guides may affect the urbanization process informally, when they are transmitted

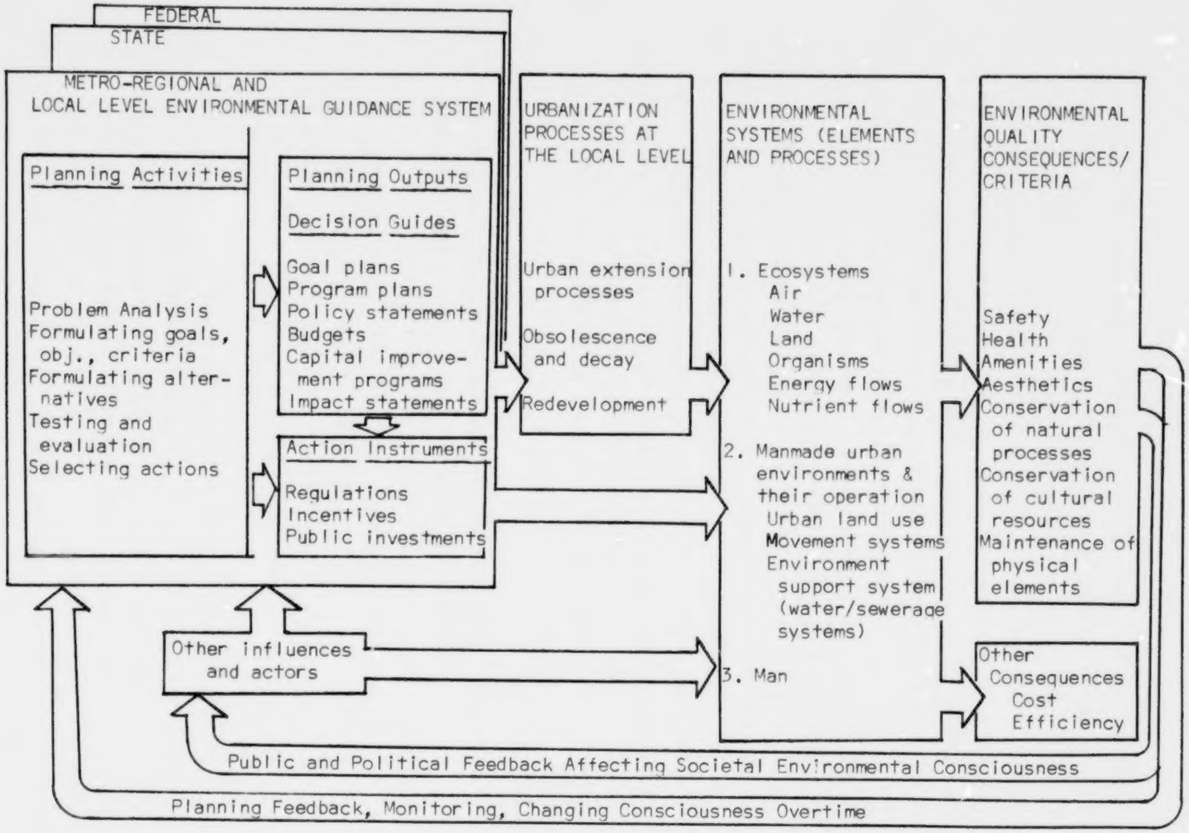
FEDERAL
STATE
METRO-REGIONAL AND LOCAL LEVEL ENVIRONMENTAL GUIDANCE SYSTEM
Planning Activities
Problem Analysis
Formulating goals, obj., criteria
Formulating alternatives
Testing and evaluation
Selecting actions
Planning Outputs
Decision Guides
Goal plans
Program plans
Policy statements
Budgets
Capital improvement programs
Impact statements
Action Instruments
Regulations
Incentives
Public investments
URBANIZATION PROCESSES AT THE LOCAL LEVEL
Urban extension processes
Obsolescence and decay
Redevelopment
ENVIRONMENTAL SYSTEMS (ELEMENTS AND PROCESSES)
1. Ecosystems
Air
Water
Land
Organisms
Energy flows
Nutrient flows
2. Manmade urban environments & their operation
Urban land use
Movement systems
Environment support system (water/sewerage systems)
3. Man
ENVIRONMENTAL QUALITY CONSEQUENCES/ CRITERIA
Safety
Health
Amenities
Aesthetics
Conservation of natural processes
Conservation of cultural resources
Maintenance of physical elements
Other Consequences
Cost
Efficiency
Other influences and actors
Public and Political Feedback Affecting Societal Environmental Consciousness
Planning Feedback, Monitoring, Changing Consciousness Overtime

FIGURE I-2
FRAMEWORK TO GUIDE THE STUDY OF URBAN PLANNING AND CONTROLS FOR PROMOTING ENVIRONMENTAL QUALITY

to the public as official advice or information, and formally, when they are translated into regulations, incentives, and public investments.

A valid examination of environmental planning and controls at the local level involves examination of planning activities, decision guides, and action instruments which together form the local environmental guidance system. Although the focus here is clearly at the local level, Figure I-I is drawn to suggest that state and federal environmental guidance systems, within which the local and metropolitan levels function, are also a part of the picture.

The Urbanization System at the Local Level

There is a third and very critical system, the urbanization system, intervening between many guidance system elements and urban environmental quality. Urbanization, as used in this study, refers to the process by which the individual urban environment changes over time. This is a slightly limited definition compared to the usual connotation of the word urbanization. Here it centers on the extension process by which a city grows, the processes of obsolescence and decay in the urban physical plant, and the redevelopment or recovery of manmade and natural environments. Figure I-2 diagrams the critical role of urbanization in the framework guiding this study. Although some environmental guidance system instruments may be aimed directly at the environmental systems of water, air, land, and so on (for example, building a public sewage treatment plant or requiring abatement devices on industrial smoke stacks), others act through the private-public urbanization processes to affect the environment indirectly (for example, subdivision regulations requiring dedication of open space). Yet other instruments (for example, purchase of open space and building a dam or levee) directly participate in the urbanization process to affect environmental quality while at the same time have developmental side effects on later private urbanization decisions.

Footnotes

1. Citizens' Advisory Committee on Environmental Quality, *Annual Report to the President and to the Council on Environmental Quality for the Year Ending May 1972* (Washington, D. C.: Superintendent of Documents, U. S. Government Printing Office [no date]), p. 7.

2. *Ibid.*, p. 7.

3. *Ibid.*, p. 12.

CHAPTER 2

ORGANIZATION OF THE REPORT

CHAPTER 2

ORGANIZATION OF THE REPORT

The report is organized into four parts along the lines of the research questions. The intent in so doing is to reinforce the independency of each part, thereby making it possible for the reader to easily isolate those matters related to his or her particular interests.

Part 1 presents the objectives, scope and conceptual framework of the study. It defines the three research questions and sketches a framework to guide examination of these questions. In addition, this chapter presents the organization of the report.

Part 2 focusses on the changing awareness and current practices in promoting environmental quality through urban planning and controls in local and metropolitan planning agencies. Chapter 3 attempts to characterize the past trends in practice and orientation of local planning agencies. In addition to comprehensive planning, the trends in three sectors of planning activity are examined. The information is based on an examination of the literature and some original documents, together with interviews with experts in the field. The investigation was hasty; there are probably omissions and biases reflecting our own interpretations and experience. The cutting edge and mainstream tend to be mixed together. It is meant neither to be definitive nor exhaustive but simply to provide a general perspective for investigating and better understanding the current state.

Chapter 4 presents the current state of practice and awareness. It is based upon responses from a survey of local and metropolitan general planning agencies throughout the United States. We have attempted to distinguish more explicitly between mainstream and cutting edge in discussing the current state of events. Thus, Chapter 4 is intended to be clearly mainstream.

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Together Part 2 characterizes the mainstream state and trends of planning for environmental quality by local and metropolitan general planning agencies. It provides a basis for better understanding where we are and where we are going, and for identifying promising new approaches, the subjects of Part 3 of this report.

Part 3, encompassing Chapters 5 through 8, addresses promising ideas and practices at the "cutting edge" of four major planning activity sectors relating to environmental quality: land use and comprehensive planning controls; planning and control systems for the water-land use interface; urban design and control systems; and residual management (limited to noise and air quality). These four chapters are the heart of the report.

The inventory and assessment of cutting edge ideas and practices in Chapters 5 through 8 are based on examination of the literature and original documents as well as on field investigations stemming from the study team's prior knowledge in this subject area along with selected leads from a survey of planning agencies and the literature. In addition to correspondence, via mail and telephone, the followups included field visits to nine metropolitan areas: Northeastern Illinois, Minneapolis, Southeastern Wisconsin, Dallas, San Antonio, Cincinnati, Boston, Durham, N. C., and Huntington, New York. In addition, spokesmen for several environmental planning approaches and programs around the country visited with the study team at the Center for Urban and Regional Studies in Chapel Hill.

No short, single-shot effort at summarizing the cutting edge of promising ideas and practices in any field as broad as urban environmental planning and controls can be complete and unbiased, however intense the study may be. Thus, this part of the report features a discussion of a limited number of examples of the major types of innovation at the cutting edge. The emphasis is on integrating these examples into a coherent perspective on local urban environmental planning and control using the guidance system framework.

Part 3 is organized so that each chapter may be read independently of the others. For example, a person with particular interests in land use, water resources, urban design or noise and air quality management may proceed directly to that chapter. A detailed chapter outline precedes the first page of each chapter.

Together, Parts 2 and 3, the mainstream of predominant practice and the cutting edge of promising approaches characterize planning for environmental quality in local and metropolitan agencies. Together they provide the foundation from which to build the guidance system recommendations of this report.

Part 4, the summary, serves several purposes. Written as an abbreviated overview, it summarizes the conclusions and recommendations of Part 2 and 3 and has an annotated index to specific topics and pages in the earlier chapters.

We have presumed that all parts of the study will not be equally relevant to its readers. The report is structured, hopefully, to satisfy the majority of these varying interests. The reading of Part II is not necessary for Part III, nor vise versa. Each of the chapters of Parts II and III are relatively autonomous and can be read independently. For those who desire, the summary chapter may itself suffice. It, however, together with the outlines at the beginning of each chapter are recommended as a basis to begin reading the report. They should assist the reader in obtaining an overview of the report, finding those particular sections of most interest, and finally, in using the report as a reference after its first reading.

PART II

CURRENT PRACTICE AND CHANGING AWARENESS

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CHAPTER 3

PERSPECTIVES OF THE '60's

Page

Comprehensive Planning 26

The Emergence of Sector Planning 27

  Urban Spatial Structure 27

  Urban Design 32

  Urban Environmental Management 37

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CHAPTER 3

PERSPECTIVES OF THE 60'S

The 1960's were a period of social turmoil in the U. S. as citizen pressure led to increasing governmental interest and intervention into issues of racial discrimination, social and economic equality, and the participation of all citizens in the public decision-making process. Most sectors of society were affected as the "New Frontier" melded into the "Great Society." The problems were great, but there was hope for solutions. However, the war in Southeast Asia intervened, drawing off resources needed to build the "Great Society." Student unrest, growing racial tension generated by actions that did not live up to promises, and finally the growing realization that the very system which had produced the "affluent society" was also poisoning the environment all played a part in forcing the country to look at itself and its problems in a new light.

Within this context, which was not generally concerned with environmental quality as we know it today, we can identify some events that demonstrate an emerging search for environmental quality as a societal commitment. They did not, of course, come out of a vacuum. Concern for the environment can be traced back to the mid 19th century and was an important element in the Conservation Movement of the early 1900's, and of many New Deal programs of the 1930's. Rapid economic growth after World War II intensified public concern for air and water pollution. Spurred by the emerging problem of smog in the Los Angeles basin, California passed an air pollution control law in 1947. The U. S. Congress legislated for control of water pollution first in 1948,

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and followed with further legislation on air and water pollution during the 1950's.

But, it was in the 1960's that the issues of the environment exploded. From Rachel Carson's Silent Spring, published in 1962, through Robert and Leona T. Reinow's Moment in the Sun (1967) to Ralph Nader's Vanishing Air, which appeared in 1970, it was evident that many people were becoming concerned about the environment. Conferences, presidential messages, and technical studies all contributed to the growing national awareness that led to federal and state legislation on open space, land use, air and water pollution control, wilderness preservation, noise pollution, solid waste disposal, historic preservation, Model Cities, and much more.

Despite this spreading awareness of environmental problems, urban planners did not lead the fight for environmental quality as we know it today. Throughout the 1960's, planners continued to struggle -- successfully in many areas -- for public effectiveness and acceptance,[1] but the planning field itself suffered from considerable internal strife.[2] This "identity crisis" was partly due to expansion of, specialization within, and politicization of the field. But, it also resulted from the public's negative reaction to planning's physical orientation, and planners saw a need to show their concern with social planning rather than merely with physical issues. In addition, local political power tended to set the planner's agenda, and this group was not interested in the issue of environmental quality. Consequently, environmental quality was a second order priority, at best, in most urban planning operations.

Comprehensive Planning

Surprisingly, comprehensive planning, the major activity of city planning during the '60's, gave relatively little attention to environmental quality issues. According to one of the planning profession's standard operating manuals, the comprehensive plan "is an official public document adopted by a local government as a policy guide to decisions about the physical development of the community. It indicates in a general way how the leaders of the government want the community to develop in the next 20 to 30 years."[3] Comprehensive planning, however, has not been truly all embracing but has focused on issues of physical development -- location, size, and spatial relationships of urban activities. During the '60's, the controversy over the scope of comprehensive planning centered on whether social, economic, fiscal, and administrative, as well as physical matters should be included. After years of this debate, urban planners are still advised to keep the master plan's focus on physical development.[4] Despite this physical emphasis, comprehensive planning's treatment of environmental quality has been inadequate. Most master plans take a cursory look at the natural environment, and superficially discuss the interface between the natural and manmade environments. Natural environmental systems have been seen as recipients of development, and the only stated quality criterion was that this development meet some nebulous standard of human toleration.

The Emergence of Sector Planning

During this same period, sector planning emerged. Commonly a part of comprehensive planning, such sectors as land use, transportation, open space, and the like were given superficial and limited treatment and developed on their own. The environmental activities of the various sectors can be grouped in three categories: urban spatial structure (conservation, desirable spatial arrangement, and accessibility); urban design (aesthetics); and urban environmental management (managing natural resources and residuals of urban activities).

Urban Spatial Structure

Three types of planning activity fall under this heading: land use, open space, and transportation.

Land use planning and controls Most dimensions of environmental quality can ultimately be traced, at least in part, to decisions concerning the utilization of land. Not only does land use impinge on other environmental elements but also land itself is a scarce and valuable resource. With the exception of land owned by the federal government, land, in the 1960's, was not normally considered a natural resource in the same sense as air and water. Instead, land use planning, which was often synonomous with master planning, was typified by continuous methodological refinement. An emphasis on data collection was part of what was considered a movement to transfer land use planning from an art to a science. The emphasis in the standard literature was on land use survey techniques, forecasting space requirements, population trend prediction, determination of economic need, and land use modelling.[5]

According to prevailing practice, land use planning was based on the anticipation of urban growth as reflected by population forecasts. Tracts of land were evaluated for the amount of predicted future development they could hold. Elements such as soils, slopes, floodplains, and other physiographic features were considered only insofar as they affected the suitability of the land for urban use. Relatively little, if any, discussion of the impact of urban use on natural environmental systems can be identified in land use plans. The emphasis was on the impact of the natural environment on urban use and the extent to which it limited development, rather than the impact of development on land and other natural eco-systems. Where environmental quality was considered explicitly, it was in terms of health and safety.[6]

Land use was generally considered a matter of local concern, and there was very little official state or national interest in the utilization of land at the urban and regional scale. At the federal level no stated land use policy for non-federal lands existed. The Soil Conservation Service, Department of Housing and Urban Development, Department of Transportation, Department of the Interior, and several other agencies all had land use or land use-related programs and activities but there was no coordinated attempt to treat land as a critical environmental resource. Scattered and incomplete federal policies relating to land use and planning appeared to rely on the wisdom and expertise of local level professional planners for proper guidance. Though the importance of guided land management for environmental quality was recognized by a few individuals -- both within and outside the federal establishment -- there was no translation of this concern into public policy.[7] A few states began to reassert their legal authority over land use decisions. Significant examples include the Hawaiian Land Use Law, the San Francisco Bay Conservation and Development Commission, the Maine Site Location Law, and the Massachusetts Wetlands Protection Program.[8]

Land use controls themselves did not undergo significant changes in the 1960's. With the exception of state involvement in land use control, changes which did occur had emerged in the late 1950's and became strong trends and in many cases the general practice in the 60's. There was considerable activity in the further systemization and sophistication of controls, including the development of performance standards. The demand for greater flexibility in land use controls increased. Planned unit development[9] and cluster development[10] became relatively wide spread as did the use of more performance oriented bulk and density standards, special conditions, special exceptions, special uses, and special districts. The broader environmental quality implications of these tools were one of their major attractions but while these often were used to achieve esthetic and amenity objectives, they were less frequently used to achieve other environmental quality objectives. Variations on existing land control devices developed such as easements and capital improvement programming.[11] Other new proposals included land banking and, in an effort to overcome the fragmentation of land use planning controls, some states moved toward state control of land use policy.[12]

Finally, there was a movement to establish entirely new frameworks for planning and managing urban development. The two most important examples were (1) the conceptual formulation of the urban development guidance system;[13] and (2) the American Law Institute's Model Land Development Code -- prepared to supersede existing planning and regulatory enabling legislation.[14] These stressed the necessity for a more dynamic, coordinated, and flexible approach to land use planning and urban development.

On balance, most land use planning during the sixties dealt with environmental quality only in a superficial and one-sided manner. The conceptual advancement that did occur, especially in the areas of the land-environmental systems interfaces and planning-control system linkages, will undoubtedly contribute positively to a reoriented land use planning in the seventies and eighties.

Open space planning Planning for the conservation and development of open spaces emerged during the fifties and evolved as one of the major sub-fields of urban planning during the sixties. So fervent were its members that open space planning at times held the aura of a full-fledged social movement. This is not surprising since it was, in reality, part of the century-old conservation movement.

The first national commitment to open space was made in the Housing Act of 1961. In establishing a federal grant-in-aid program to assist local and state governments in acquiring open space land, Congress listed four purposes for this law: (1) to help curb urban sprawl; (2) to prevent the spread of blight and deterioration; (3) to encourage more economic and desirable urban development; and (4) to help provide necessary recreational and conservation areas.[15]

The Housing and Urban Development Act of 1965 expanded the open-space land program to include urban beautification and improvement. It also authorized special grants for the provision of open space land in builtup urban areas.[16] It made explicit the need for identifying open space within urban areas as well as regional open space around urban areas. HUD has stated that the trend during the sixties was to fund projects "where the people are" and cites the fact that the number of projects over 500 acres have decreased from fifteen percent to three percent while projects under ten acres have increased from 13 to 32 percent.

Along with the federal initiatives in the open space sector, the nineteen-sixties saw continuing conceptual and methodological development in this field. The overriding concern of experts and novices alike was the threat of urban sprawl "using up" unspoiled land resources. Ecological concerns were introduced into the planning profession through open space studies. Marion Clawson, for example, stated that one of the functions of open space is to provide "ecological protection of important values, such as recharge to groundwater, or prevention of flood damage in flood-prone areas, preservation of unique areas, and the like."[17] Ian McHarg and his associates innaugurated a new regional planning approach which combined ecology, open space planning, and design.

A landmark study in the field was Ann Louise Strong's Open Space for Urban America, prepared for HUD's Urban Renewal Administration.[18] Her recommendations indicate the significant management orientation which characterized open space planning during the sixties. The books, articles, and other documents dealing with open space were rich with recommendations for guidance system instruments to achieve open space needs. This may have been the most implementation-conscious field of planning at the time. Unfortunately, the concrete results of open space planning were not as noteworthy and plentiful as were contributions to the literature.[19] Fee simple acquisition remained the dominant approach to implementing open space proposals and the amount of land reserved for open space was relatively small.

Transportation planning With a heavy emphasis on engineering, urban transportation planning has existed, for several decades, both within the mainstream of planning concern and without as a separate field. Though transportation has traditionally been included in the comprehensive planning process, many cities and metropolitan areas have had separate planning and transportation agencies. As a result, transportation decisions were made independently of any thorough examination of policy priorities for the urban area. Since Mitchell and Rapkin wrote Urban Traffic: A Function of Land Use,[20] a somewhat tenuous alliance has emerged.

In general, transportation planners were not concerned with environmental issues as defined here. Though there were certainly numerous conservation-transportation confrontations during the sixties,[21] social and economic demands far outweighed environmental pressures. Their primary endeavor was the accommodation of an increasingly mobile society with a continuously inadequate transportation system. Also evident in the literature is a considerable preoccupation with theoretical and technological refinement of transportation planning methodologies and techniques. There was considerable discussion of forecasting and modelling, but almost no soul searching with respect to the role of transportation in the larger urban areas.

While some transportation planners espoused a concern for environmental quality, this was for the most part in the prevailing planning context of the period rather than with respect to natural systems. Even in this context, however, it was assumed that these matters would be handled by land use planners, transportation engineers, and landscape architects. As will be noted later, a concern for the visual and amenity quality of highways was manifest during this period, but this was primarily the concern of engineers, planners and designers.

Urban Design

Conservation efforts directed at aspects of the natural environment had their beginnings in the mid-nineteenth century. Concern for the built, urban environment is much more recent. Starting with the Housing Act of 1949, the federal government began its series of programs aimed at these problems. Physical deterioration is the environmental quality dimension around which each of the programs has -- at least in part -- been formed.

Urban renewal The renewal process was characterized by two phases: (1) the clearance phase (designation, relocation, acquisition, clearance), and (2) the rebuilding phase. This process was reinforced by the federal-local government partnership provided for in the legislation. The federal government set standards and provided financial assistance for clearance. The local government, in partnership with private business, and with grants in aid from the federal government if needed, rebuilt the cities. The standards set by the federal government dealt primarily with definition of "built;" eligibility requirements for grant-in-aid programs; funding ratios; and relocation policies. Other programs included strong citizen participation, and anti-discrimination policies in all aspects of the process. Except where other federal programs (public housing) were to be part of the rebuilding, the federal government limited its impact primarily to the first phase of the renewal process. Local governments, in partnership with private business, carried the responsibility for building environmental quality back into renewal areas.

The urban renewal program as established by the Housing Act of 1949 took a narrow, unidimensional approach to the problem of a deteriorating urban environment. That approach was "slum clearance" which operated on the notion that eliminating the physical slum would solve the attendant social, economic, and health problems. The Housing Act of 1954[22] extended the renewal concept from "slum clearance" to include preservation and rehabilitation. The 1959 amendments to the 1949 Act created the "Community Renewal Program" (CRP) and provided for greater federal involvement in the renewal efforts of local communities by increasing both the dollar amounts of grant-in-aid and the types of grant-in-aid programs available for renewal.[23] By the late 1950's, the urban renewal program was losing its unidimensional character as it attempted to broaden its scope to include more social factors and to expand its approach to include rehabilitation and code enforcement.

The Demonstration Cities and Metropolitan Act of 1966 (Model Cities) marked one of the last significant changes, during this period, in federal attention to problems associated with deterioration of the built, urban environment. In theory, the 1966 Act emphasized the physical, social, and economic dimensions of urban problems. In implementation, however, the social and economic dimensions received most of the attention.

The changes in the renewal concept during the 60's, from a mainstream point of view, were primarily: (1) making renewal more comprehensive by increasing the number of influencing factors to which renewal efforts must respond; (2) making renewal activities more participatory, increasing the role of the general public in the decision process; and (3) making the renewal process itself more sophisticated with the development and use of new methods and techniques of planning. However, underlying these prominent, visable changes were also changes in the orientation to the urban environment and its relationship to man. Aesthetics, amenity, and quality of life were concerns which acted as common threads throughout the 60's.

Local governments in conjunction with planning and design consultants, local special interest groups, and private developers carried the primary responsibility for defining and filling environmental quality objectives in the rebuilding phase. The urban renewal concept provided some important implementation possibilities for the inclusion of environmental quality objectives. For example, large-scale sites allowed a project to pursue multidimensional objectives; public ownership of the land provided opportunity for economic incentives to facilitate the inclusion of aesthetics and amenities as well as the ability to build in control packages that were unacceptable under general zoning controls; and at least conceptually, the possibility was there to carry through a comprehensive planning-design-construction program from start to finish. However, local governments were primarily interested in removing the gray areas around the CBD to revitalize commercial and/or industrial activities in the center city.

Urban renewal also provided the opportunity for the formulation of a new design orientation. With urban renewal providing large sites, the opportunity for increasing the scale and diversity of the design product was available. Whole "communities" offering a wide range of activities could be created in the rebuilding process. At this scale of design a multidisciplinary approach was needed, one that could synthesize, at the boundary, the roles fulfilled by architecture, landscape architecture, and planning. The mid 50's saw this rebirth of the concept of urban design. However, urban design seemed to concentrate on traditional concerns of formal expression, symbolism, and aesthetics as determined by elite tastemakers. This orientation, coupled with a lack of substantive knowledge concerning the relationship between the user and the environment, resulted in projects which were often highly praised by the design professions, but which prove unlivable to the users. The actual impact of urban renewal was disappointing. The limited scope of redevelopment, relocation of residents, and the failure to actually implement many of the plans were viewed as major drawbacks. The inability of the public authorities to provide more than the barest functional necessities in their capital improvement projects was seen as a serious drawback by those concerned with visual and amenity quality.[24]

Planning for aesthetic objectives Aesthetics, amenity, and other "higher order" needs have been important to many individuals for a long time, but aesthetics was considered a personal, not a public, concern. It was not until the early 1960's that aesthetics began to be discussed in its own right. Growing concern about and interest in citizen participation in public decision-making required that the elitist tendencies of public "tastemakers" be modified or abandoned. Since the aesthetic principles proved hard to define, efforts were concentrated in areas where general agreement could be reached: (1) amenity, which can be defined in terms of things -- benches, trees, and so on; (2) the assumption that nature is inherently beartiful; and (3) preservation of historic buildings and areas.

Four program areas involved planning for aesthetic objectives: (1) open space and beautification; (2) highway protection; (3) community appearance programs; and (4) historic preservation.

Open space and beautification One of the first federal programs to deal directly with aesthetic objectives was Title VII, open space land.[25] This program[26]

> "authorized $50 million in federal grants to states and localities to pay up to 30 per cent of the cost of acquisition of land in and around urban centers to create open space areas for recreational, conservation, scenic and historic purposes."

The next significant change in open space/urban beautification came with the HUD Act of 1965 (PL 89-117). This act was passed after the President's 1965 message to Congress on natural beauty and the White House Conference on Natural Beauty (May 24-25, 1965). It reflects what might be the federal high water mark on "beautification." The major change was to increase the scope of the program from "preserving" to providing, preserving, and developing open space land.

Highway protection From the mid 50's to the mid 60's there were three significant state projects which provided solid experience for programs of highway beautification: (1) the Wisconsin ten year, fifty million dollar program of resource development, including scenic roads, recreation, and conservation; (2) California's work on an official scenic highway program, including two reports, A Preliminary Plan for Scenic Highways in California (1962) and The Plan for Scenic Highways in California (1963), resulting in the California Legislature designating 4,900 miles of state highway routes "State Scenic Highways" (July 1963); (3) the reports to the joint fact-finding committee on highways, streets, and bridges of the Washington State Legislature calling for additional scenic areas along the state highways of Washington.[27]

On October 22, 1965, the Highway Beautification Act of 1965 (PL 89-285) was passed. It contained three important provisions: (1) 10 per cent of federal-aid highway funds could be withheld if effective provisions to control outdoor advertising were not made by the state; (2) a new program was developed to control junkyards along interstate and primary system highways; (3) 3 per cent of federal-aid highway funds could be provided annually (without matching funds) to states for landscaping and scenic enhancement.[28]

Community appearance programs Local authorities' concern for community appearance which emerged in the 1950's, continued to develop in the 1960's. The courts (Berman v. Parker, for example) continued to expand the acceptance of the police power to achieve aesthetic objectives making possible increased use of zoning powers for this purpose.

Architectural control, or design review -- generally aimed at certain elements and sections of cities or towns -- expanded rapidly during this period. For the most part these were unrelated to comprehensive design programs or policies. Many communities created public or private beautification commissions, depending on an advisory review protocol to influence developers. In most cases, no sanctions existed except those which were implicit in any public-private relationship at the local level. In addition, some commissions carried out beautification programs or encouraged private sector organizations to undertake such activities.

Consistent with this emphasis on appearance, many cities, concerned with protecting the public's ability to see particular points of aesthetic quality, adopted zoning regulations to protect certain views. Many communities adopted ordinances for the provision and protection of trees in public areas and some required their planting in new residential subdivisions.

Historic conservation Generally, activities in this area can be characterized as being in the private sector, implemented by non-professionals with an orientation toward preservation of unique, individual buildings of significance. To a small extent, preservation was attempted at the local level through the use of architectural controls in historic districts. This use of the police power was justified under the general welfare clause.

In several isolated instances during this period, significant preservation of historic areas took place within the context of the urban renewal program, for example, Providence, R. I., Philadelphia, and Boston.

The late 60's saw historic preservation grow from a plaything for antiquariats to a public program for environmental conservation. The scope began to change from concern with architecturally and historically significant buildings and districts, to include elements of local culture and visual value. The federal government not only enlarged the national register for historic sites but also encouraged, through incentives (matching funds), establishment of state registers and employment of systematic survey methodologies.

Urban Environmental Management

Water Quality Controlling water quality has traditionally been regarded as a responsibility of state and local governments. However, because of the general unwillingness and/or inability of these governments to deal effectively with the growing problems of water pollution, the federal government has become an increasingly important force in water quality management. Although federal measures to control water pollution have been introduced periodically since 1886 and a few significant laws passed (for example, Refuse Act of 1899, Oil Pollution Act of 1924, Public Health Service Act of 1912), the first significant federal studies of the water quality problem were undertaken in the 1930's by the National

Resources Committee and its successor, the National Resources Planning Board. The NRC set up the Special Committee on Water Pollution which produced a series of reports recommending federal action in cooperation with state agencies.[29] The first federal program for water quality control was established by the 1948 Water Pollution Control Act. The federal role in this program was secondary to state and local action but included technical and financial assistance, surveys, loans for treatment plants, and a weak enforcement procedure to abate public nuisances.[30] In 1956 this program was made permanent (PL 84-660) and somewhat stronger.

The 1960's saw rapid change in the federal water quality program. Two initial forces were the National Conference on Water Pollution in December 1960, and the 1961 Senate Select Committee reports on national water resources.[31] In July 1961, new Federal Water Pollution Control Act Amendments increased construction grants and state program grants, expanded the weak enforcement procedures to all navigable waters, increased research programs, and authorized storage in federal reservoirs for low-flow augmentation. However, these amendments still did not face the question of effective federal enforcement and thus did little to improve water quality.

Following a study by a Senate Special Subcommittee on Air and Water Pollution, the Water Quality Act of 1965 was passed. The Act authorized the establishment of state-federal standards and created the Federal Water Pollution Control Administration in the Department of Health, Education and Welfare (which was shifted to the Department of the Interior in 1966). This act was a milestone in the federal water quality program since it was the first significant step toward formulation and enforcement of a national water quality policy.

In spite of this apparent progress, dissatisfaction with the results remained high; new water quality reports and proposals for further reform appeared and much concern was manifested in Congress: The National Academy of Sciences' National Research Council published a comprehensive study of environmental pollution;[32] a President's Science Advisory Committee made a report recommending extensive augmentation of federal measures; Senator Muskie's Subcommittee published its findings calling for massive increases in construction grants; and the White House proposed a "Clean Rivers Restoration Act" calling for regional pollution control. In response, the Clean Water Restoration Act was passed, increasing construction grants up to a possible 55 per cent of the cost, expanding research and training programs, and providing up to 50 percent grants for state planning on a regional basis. Also in 1966, President Johnson via an executive order (# 11296) broadened the federal flood control program to include non-structural measures such as flood plain development controls and flood hazard information and insurance programs. It took until 1970, however, for development of national integrated policy on water quality to be developed.

Water quality: local action The basic urban approach to water quality management (and water resource development in general) has been an engineering one in which the overriding objective is the provision of efficient systems to meet increasing demands. The institution to accomplish this has generally been a single-purpose, operation oriented, somewhat autonomous city department or metropolitan district. This approach has produced good results in terms of the quality and dependability of water supply and wastewater disposal services, but it has been very slow to adapt to shifting urban needs, broader objectives, and new technology.[33] Although this urban approach did not change much in practice during the 1960's, there has been considerable awareness, in the literature and at conferences, of the need for change, especially for more integration between water resource planning and development and land use planning and controls.

Water quality management became the basic urban water resource concern during the 1960's. This was partly because of the rapid urbanization and accompanying degradation of the environment but was also a direct result of the Water Quality Act of 1965 and the subsequent formulation of state water quality standards.

The local water quality planning and guidance system has developed mostly since 1965. It basically consists of FWPCA (now EPA) and HUD grants and guidelines, state standards and enforcement, and local physical development. This system has not been very effective for many reasons, including the fact that city planning departments were primarily interested in metropolitan growth and service extensions rather than in actual management of water quality.

Air quality Until the middle 60's, the control of air pollution was a local responsibility and was generally included under nuisance powers which were an unworkable means of addressing widespread pollution problems. The only urban area with effective control was Los Angeles County. The unique situation there -- frequent temperature inversions and vast sources of pollution -- led to great public support for pollution control measures which were developed about twenty years ahead of the rest of the country.[34]

Air quality management at the federal level had its great awakening and basic legislative formulation in the 1960's with passage of the Clean Air Act of 1963 (partially a result of the failure of states and cities to take action); the Motor Vehicle Air Pollution Control Act (1965); and the Air Quality Act of 1967 which established the first comprehensive federal involvement in air quality management, using the same principle of state-federal standard setting as the Water Quality Act of 1965. However, the great push in implementation was yet to come via the Clean Air Amendments of 1970.

Noise control Noise pollution was virtually unrecognized as a problem until the 1960's. Even though some states and many cities had noise ordinances (on mufflers, for example), they were seldom enforced and generally not seen as part of an overall environmental noise problem. The major exception to the lack of interest in noise control is Memphis, Tennessee, a city which has had an effective noise abatement program since 1940. The program included an operational noise ordinance, a new zoning ordinance using noise control as one of its determinants, strict enforcement of the ordinance, and an effective public education and participation program.[35] In 1965, New York enacted a highway anti-noise law. California followed in 1967. Also in 1967, New York City established a Bureau of Noise Abatement and drafted a citywide noise ordinance.

At the federal level there has been little action and most of that has been directed toward aircraft noise control. In 1967, President Lyndon Johnson established the Federal Interagency Aircraft Noise Abatement

Program. Since then, the Federal Aviation Administration has issued noise standards for aircraft, and NASA has demonstrated new technology to cut down on aircraft noise. In other fields, the Department of Labor has issued federal standards for occupational exposure to noise (1969), and HUD has issued interim standards for housing site location to reduce the effects of noise.[36] However, as in other areas of environmental pollution, the most significant federal step in noise control came in 1970 under the Clean Air Amendments (PL 91-604) where Title IV provides for the establishment of an Office of Noise Abatement and Control in the Environmental Protection Agency.

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CHAPTER 4

THE CURRENT SCENE IN LOCAL AND METROPOLITAN PLANNING AGENCIES

Page

Summary 47

The Sample and Questionnaire 50

General Orientation to Environmental Planning in Local and Metropolitan Planning Agencies 55

  What is Environmental Planning Anyway? 56

  Relative Importance of Environmental Problems 57

  Environmental Planning as a District Work Activity of the Agency 59

  Environmental Quality as a Goal in the Agency's Other Planning Program Areas 62

  Environmental Expertise on Planning Staff 62

Implementation of Environmental Quality Objectives 66

  Effectiveness 66

  Information and Studies used in Determining the Substance of Implementation Instruments 69

Influencing Factors in Raising Environmental Issues and in Implementing Agency Recommendations 70

Intergovernmental Relationships in Environmental Planning and Implementation 80

  The Effect of Federal Legislation, Organization or Administration 81

  The Effect of State, Regional, Metropolitan or Local Legislation, Organization, or Administration 81

Adequacy of Existing Framework of Federal and State Environmental Legislation, Policies, and Activities 82

The Role of Local Government and its Planning Agencies 84

CHAPTER 4

THE CURRENT SCENE IN LOCAL AND METROPOLITAN PLANNING AGENCIES

Following an historical perspective the question naturally arises: where is the mainstream of awareness and practice in planning for environmental quality in local and metropolitan general planning agencies today? The purpose of this chapter is to answer that important question by reporting the results of a survey of a broadly representative national sample of local and metropolitan planning agencies conducted in the fall of 1972.

We utilized a mail survey of planning agencies because literature sources and experience, however adequate as sources for an historical perspective, inevitably lag behind the current scene, especially a scene that is changing so fast. Only those on that local scene, currently practicing in the nation's many city, county, and metropolitan agencies know what is happening in their local areas at the moment.

In contrast to the historical perspective in the previous chapter, which treated both mainstream and cutting edge developments, this chapter will definitely emphasize the mainstream. Questionnaires and random samples cannot ferret out the relatively rare cutting edge innovations that are just beginning to appear.

Summary

In September 1972, six hundred and two questionnaires were mailed to a random sample of local and metropolitan planning directors. The questionnaire was designed to obtain information and judgments about agency orientation to environmental planning and relative importance placed on environmental planning; influential factors in raising environmental issues at the local level; importance of environmental goals; implementation practices, their effectiveness and the factors that aid or impede implementation. Information on these topics was collected in a precoded format. The questionnaire also pursued the following questions in a more open-ended manner: the director's perception of the role of local government and its planning agencies in promoting environmental quality; the effect of regional, state, and federal legislation and organization on local government; and an assessment of such legislation and organization from the position of local government.

Our tight study schedule necessitated an early cutoff date so that only 178 usable returns, a 29 per cent response, were in hand for coding and computerizing. Fifteen late returns were included in analyses of open-ended questions.

The analyses addressed four topics: general orientation, implementation, influencing factors, and intergovernmental relations.

General Orientation While there is definitely a growing concern about environmental quality among local agencies, it is a recent phenomenon, tending to follow, not to lead, the general national environmental consciousness. In addition to the problem of building staff competence in environmental fields, the local political climates are probably another reason for this lag. Agencies tend to approach the issue by incorporating environmental quality goals into an already broad range of concerns -- concerns which have the traditional bias toward urban values, comprehensiveness, and balance among multiple objectives -- rather than by focusing on individual environmental problems. Also, problems of the manmade environment (noise, for example) apparently are not viewed as part of the overall environmental concern. Although many agencies are setting up separate work programs in environmental planning, few employ staff trained in environmental fields.

Implementation The most effective implementation devices seem to be regulations and public investment, but few agencies suggested public investment as an appropriate role for local government. Specifically, burning ordinances, subdivision regulations (especially, for instance, provisions for burying utilities), planned unit development regulations, floodplain zoning, open space acquisition, and development of parks and recreation facilities were suggested as effective implementation methods. Information/advice devices, including the various review processes, appear to be considered generally ineffective, as are some regulatory devices often linked to environmental planning, for example, litter and noise ordinances, excavation controls, and large lot zoning incentives. Pricing, and tax policies appear to be little used.

The land use plan, federal and state guidlines, and model codes are the common bases for determining implementation procedures. Special environmental studies are seldom used in formulating implementation instruments. We feel that our data suggest a need to develop strategies to encourage local agencies to utilize available environmental information in their determination of guidance instruments.

Influencing Factors Factors influencing introduction of environmental issues and those affecting implementation of agency recommendations are similar: staff attitudes, ideologies, and expertise; local groups -- legislative body, interest groups, commissions and advisory boards; and higher level government -- via federal and state guidelines, regulations, and funding. However, agency staff and local groups were listed as influencing factors far more often than higher level government. Furthermore, three local factors -- governmental fragmentation, distribution of responsibility among agencies, and dispersal of financial resources -- appear to have the greatest negative influence.

Environmental impact statements, crises, programs of other communities, and court action were all relatively unimportant influences on the local scene, according to our respondents. We had hypothesized that they would be significant and certainly expect them to increase in importance over the next few years.

Intergovernmental Relations Local agencies seem to feel that higher level government has a positive impact that is generally not as significant as local factors. Of the federal agencies, HUD received the largest number of negative responses. Agencies are not satisfied with the intergovernmental framework and suggested changes, such as increased funds, stronger state enabling legislation, and more efficient coordination among governments, primarily at federal and state levels. Respondents defined local government's role as maintaining community awareness; implementing regional, state, and federal policies; and addressing environmental issues that do not extend across jurisdictional boundaries.

The overall view gained from this survey is one of considerable environmental concern but of only modest planning and implementation activity with indirect introduction of environmental goals into a broad range of traditional urban planning concerns. Local government is currently the weak link in the intergovernmental environmental policy framework mainly because it lacks technical capacity and is underutilized by higher levels of government. However, the findings suggest that local governments do have a strong sense of responsibility and would respond positively to further encouragement of greater participation in environmental planning. Any such approach must recognize, however, that local planning agencies are inclined to incorporate environmental quality goals into planning and decision making without changing basic urban values or discarding a comprehensive approach to planning for multiple objectives. The survey revealed few radical suggestions for solutions and indicates that local planners are pragmatic and painfully aware of conflicting objectives and constraints. They are not likely to be receptive to a narrowly focused environmental sector planning and implementation strategy.

The Sample and Questionnaire

The survey utilized a stratified random sample of local and metropolitan planning agencies in the United States. A random sample design was selected to achieve a broadly representative and unbiased picture. The sample was then stratified to assure an adequate sample size in each of four important categories of planning agencies: metropolitan regional agencies, planning agencies of the metropolitan central cities, suburban and non-metropolitan city agencies, and county planning agencies. It was hypothesized that these categories of agencies and their jurisdictions might have significantly different perceptions and experience about environmental problems, planning approaches, and the relative importance of environmental quality compared to other items on their governmental agendas.

The questionnaire was designed to obtain information and judgments from the planning director about his agency's orientation to environmental planning and its relative importance, influential factors in raising environmental issues at the local level, the importance of environmental goals in various planning program areas in which the agency engages, the agency's implementation practices and their effectiveness, and factors that intervene positively or negatively in the implementation of the agency's recommendations. Information in these areas was collected in a precoded format. The questionnaire also pursued the following questions in a more open-ended manner: the director's perception of the role of local government and its planning agencies in promoting environmental quality; the effect upon local government of the framework of regional, state, and federal legislation and organization; and an assessment of that framework from the position of local government. The questionnaire is reproduced in the Appendix.

Six hundred and two questionnaires were mailed to planning directors in early September of 1972, approximately 150 in each of the four strata. By October 15, the cut-off date necessitated by a tight study schedule, 185 returns were in hand, representing a 30 per cent response rate. Of these, 178 were usable. The answers were coded and the data were put on the computer. Fifteen additional later returns were included in the analyses of the open-ended questions concerning the intergovernmental framework, which were not coded for the computer. A breakdown of sample size, number of returns, and the number of returns usable in the final analysis, by stratum, is provided in Table 4-1.

The composition of responding agencies suggested that the original four-level stratification used for sampling be converted to a five level classification for analysis: metropolitan regional agencies, metropolitan

TABLE 4-1

THE STRATIFIED RANDOM SAMPLE
DESIGN AND THE DISTRIBUTION OF RESPONSES

Planning Agency Sampling Strata Identification	Number in Sample	Number of Responses	Number Usable for Analysis	Description of new strata more suitable for analysis of data
Metropolitan-regional agency	137	40 $\longrightarrow$ 40	40	Metropolitan-regional agency
Central city agency in metro-area	158	36[a] $\xrightarrow{33}$ 33	33	Central city agency in metro-area
Other municipalities	147	55[a] $\xrightarrow{40}$ 40 55[a] $\xrightarrow{13}$ 36	40	Other municipalities, SMSA
Counties	160	54[a] $\xrightarrow{29}$ 29 54[a] $\xrightarrow{23}$ 36	29	Counties, SMSA
			36	Cities and counties, non-SMSA
Totals	602	185 (30% response rate)	178	

---

[a] A total of 7 returns turned out to be from joint city-county agencies which did not fit into any one of the analytic categories -- 3 from principal city stratum, and 2 each from "other municipalities" and "counties" strata. These 7 were dropped from the sample for all analyses.

central city agencies, agencies from other municipalities in metropolitan areas, county agencies within metropolitan areas, and finally non-metropolitan city and county agencies. The first four categories of agencies are all located in metropolitan areas while the fifth group contains only non-metropolitan city and county agencies (including 13 municipal planning agencies and 23 county planning agencies). This five level breakdown enables an additional significant distinction to be made between metropolitan and non-metropolitan agencies while maintaining a sufficient number of responses in each of five categories to assure some degree of confidence when generalizing findings, either within or among categories. The distribution of useable responses by region and five-level stratification is shown in Table 4-2.

Before reporting the results from the analyses of the survey data, a few words of caution are necessary. First, while excellent sample frames exist for metropolitan regional and metropolitan principal city agencies, no accurate nation-wide sample frame of county and city planning agency directors could be found. Hence the American Society of Planning Officials' list of 615 Planning Advisory Service subscribers in these two strata was used as the best available sample frame of names and addresses. The ASPO sample frame is likely to be biased toward larger agencies with bigger budgets and more progressive and aggressive programs as well as higher probable levels of interest in environmental problems. Hence, the responses from municipal and county agencies are likely to represent proportionately more environmentally aware and active programs than would a sample drawn from a more balanced sample frame.

Secondly, the 29 percent who responded to the questionnaire are likely to represent agencies and directors more interested in planning for environmental quality and more actively engaged in it than the 70 percent who did not respond. This would produce further bias toward higher levels of environmental consciousness and practice in the sample responses.

Thirdly, we should not lose sight of the fact that the data are provided by individuals within an agency and in response to a mailed

TABLE 4-2

DISTRIBUTION OF USABLE RESPONSES BY EPA REGION AND PLANNING AGENCY SAMPLING STRATA

			Number of Responses by Region										
			1	2	3	4	5	6	7	8	9	10	
			Conn. Maine Mass. N. H. R. I. Vt.	N. J. N. Y.	Del. D. C. Md. Penna. Va. W. Va.	Ala. Fla. Ga. Miss. Kent. N. C. S. C. Tenn.	Ill. Ind. Minn. Mich. Ohio Wisc.	Ark. La. N. M. Okla. Texas	Iowa Kan. Mo. Nebr.	Colo. Mont. N. D. S. D. Utah Wyo.	Ariz. Calif. Hawaii Nev.	Wash. Ore. Idaho Alaska	Total Responses
Sample Strata	1	Metropolitan-regional agency	4	3	3	11	6	4	2	2	3	2	40
	2	Central City agency in Metro-area	1	2	7	4	7	3	3	2	2	2	33
	3	Other municipalities in SMSA	4	4	0	4	9	1	1	0	12	2	37
	4	Counties, SMSA	0	7	7	0	10	1	0	1	2	0	28
	5	Cities & Counties, non-SMSA	2	4	5	5	9	1	3	2	4	4	39[a]
		Total	11	20	22	24	41	10	9	7	23	10	177[a]

[a] Sub total and grand total one less than actual number analyzed.

questionnaire. Questions were carefully phrased to call for responses reflecting agency views and practice rather than those of the individual answering the questionnaire, but the data are certain to reflect the particular respondent's attitudes and the scope of his knowledge about the agency. Two persons in the same agency or the same person on another day might answer some of the questions differently.

For these three reasons, then, the data are not as reliable and unbiased as data gathered through examination of records, direct observation in the field, or even personal interviews. Nevertheless, the survey does provide a usable and timely reading not otherwise available on local level environmental planning. Normal precautions and procedures of social science methodology were observed in sample design and selection, questionnaire design, mail survey procedures, and data processing. Within reason, keeping in mind the cautions mentioned above, the data should be a reasonable reflection of environmental consciousness and practice today in metropolitan and local planning agencies.

General Orientation to Environmental Planning in Local and Metropolitan Planning Agencies

The general orientation of local and metropolitan planning agencies to promoting environmental quality is estimated in the survey in five ways:

1. the agency's definition of environmental planning;
2. the past and current relative importance of environmental problems in the agency's area of jurisdiction (city, county, metropolitan area);
3. the number of staff personnel trained in environmental fields;
4. whether environmental planning exists as a separate work program; and
5. the role of environmental quality in the more traditional planning programs engaged in by the agency.

What is Environmental Planning Anyway?

> The little boy in the cartoon was walking past a junkyard heaped with old cars and asked his father, "That's a lot of environment, isn't it?" The boy is a pretty good analyst of the contextual meaning of words. Public discussion of environmental problems has produced the quick association: environment -- pollution. Environmental planning is becoming antipollution planning.[1]

This quote represents one view of what environmental planning is. It, along with three other common representations of environmental planning were presented to respondents, who were asked to choose the one that best expressed their agency's viewpoint. The question was asked in the following manner:

> Which one of the following phrases best expresses your agency's view of environmental planning?
>
> a. Provision of anti-pollution systems and controls
> b. Designing urban environments for human use
> c. Integrating man-made and natural systems
> d. Protecting natural eco-systems

The anti-pollution view is meant to characterize the field of environmental engineering, the current focus of the Environmental Protection Agency with its emphasis on air and water quality, solid waste management, radiation, noise and pesticides, and the conceptualization of these problems as one of reduction of harmful residuals through changes in production processes or modification of residuals after generation, e.g., sewage treatment. The phrase, "designing urban environments for human use," is meant to characterize the profession of urban design with its emphasis on designing, enhancing, or preserving attractive and functional man-made urban environments for the use and enjoyment of human beings. The phrase, "integrating man-made with natural systems," is meant to characterize those approaches seeking the best of several worlds, looking for a balance between nature's values and the demands of urban man pursuing both his economic development goals and a man-made environment coincident with the community's perception of the good life including a high standard of living, economic development, economic efficiency, and social equity. The last of the four phrases, "protecting natural eco-systems," was meant to characterize the viewpoint of the conservationist oriented movement in which protecting ecosystems from environmental alterations that disrupt the basic energy flows or nutrient cycles is the primary objective and natural system constraints are regarded as having overriding importance in allocating urban growth.

Table 4-3 summarizes the responses by planning agency type. The predominant sample wide response was clearly "integrating man-made and natural systems." Central city and other municipal agencies within metropolitan areas, however, were about as likely to define environmental planning as "designing urban environments for human use." Metropolitan city agencies, particularly those of the central city, represent areas almost entirely built-up and are therefore going to be especially concerned with the man-made urban environment, perhaps more than with the problems of balancing urban growth with natural processes on the urban fringe. For this reason, their pattern of having two equally predominant responses, one of which emphasizes the quality of the built environment, is understandable.

These results suggest that environmental planning within urban planning agencies reflects its context -- a planning organization of broad concerns, having the traditional bias toward urban values, comprehensiveness in approach, and belief in a balance among multiple objectives. Environmental problems and the goal of environmental quality tend to be added to and perhaps integrated with the other problems and goals on the local agenda. Neither the sector planning response (anti-pollution systems) or the conservationist response to urban growth (protecting eco-systems) is very commonly held in metropolitan and local planning agencies today.

Relative Importance of Environmental Problems

As another dimension of metropolitan and local planning agencies' orientation to environmental planning, respondents were asked to indicate the relative importnace of environmental problems in their jurisdictions. The following question was asked: From your agency's point

TABLE 4-3

VIEWS OF THE MEANING OF ENVIRONMENTAL PLANNING, BY AGENCY TYPE

View of environmental planning:	Percentages by Type of Planning Agency					Percentages for full sample
	Metropolitan Area				Non-Metro	
"Environmental planning is mainly:"	Metro Agency	Central City	Other Municipality	County	City & County	
Provision of anti-pollution systems and controls	5%	7%	8%	11%	9%	8%
Designing urban environments for human use	18%	45%	43%	14%	24%	24%
Integrating man-made and natural systems	65%	41%	46%	43%	53%	51%
Protecting natural eco-systems	13%	7%	3%	32%	15%	13%
N =	(40)	(29)	(37)	(28)	(34)	(168)

X^2 = 24.7 with 12 d.f., sig. @ .02 level.

of view, how important are environmental problems in your agency's jurisdiction? In the 1960's? Presently? The percentages of agencies giving each of four possible responses is summarized in Table 4-4.

The responses support the argument made by Galloway and Huelster that the planning profession has followed rather than led the national awareness of the natural environmental crisis.[2] In the 1960's, less than 20 percent of the agencies regarded environmental problems as critical and one-third thought them unimportant. Currently 70 percent regard them as critical problems, 26 percent as the most critical problem in the agency's jurisdiction, while only 2 percent regard them as unimportant.

Environmental Planning as a Distinct Work Activity of the Agency

As a third measure of a planning agency's general orientation to environmental issues, respondents were asked to state whether "environmental planning" had been established as a distinct work activity by the agency. As shown in Table 4-5, about 40 percent of the agencies have established such a separate activity. Thus, even if environmental problems have only recently come to be realized as critical in metropolitan and local planning agencies, a considerable proportion of these agencies have begun establishing environmental planning as a distinct work activity. This is especially true of metropolitan agencies as well as principal cities and counties in metropolitan areas.

Within the scope of these separate environmental planning programs, agencies tended to include activities addressing land use, open space, water and sewer, and solid waste. These topics were included in well over 50 percent of the environmental planning programs with exception of metropolitan cities which did not include water and sewer programs under environmental planning. Transportation, housing, and design and appearance were included slightly less often -- 40 to 50 percent of the responses. No other area of planning was included in over 30 percent of these distinct environmental planning programs. Surprisingly, this group included such topics as air quality (included in 24 percent of

TABLE 4-4

IMPORTANCE OF ENVIRONMENTAL PROBLEMS IN THE AGENCY'S JURISDICTION

Responses indicating level of importance	Percentage Distribution of Responses:	
	1960's	Present
Our most critical problem	7%	26%
Critical, but not most critical	12%	44%
Important, but not critical	46%	28%
Relatively unimportant	34%	2%
N=	(153)	(170)

Note: There were no significant differences in response between types of planning agencies.

TABLE 4-5

PERCENTAGES OF AGENCIES HAVING ENVIRONMENTAL PLANNING AS A SEPARATE WORK ACTIVITY, BY TYPE OF AGENCY

Type of Planning Agency	Percentage having established environmental planning as a separate work activity
Metropolitan	51%
Principal City in metro area	53%
Other municipality in metro area	28%
County in metro area	48%
County not in a metropolitan area	21%
Overall Sample percentage	40%

environmental planning programs), noise (22 percent), and historic conservation (30 percent).

Environmental Quality as a Goal In the Agency's Other Planning Program Areas

Regardless of whether or not the agency was engaged in a separate and distinct environmental planning program, respondents were asked whether they were engaged in any of a list of fairly common program areas that might be related to environmental quality and if engaged therein, how important the environmental quality goal was to that program area. Table 4-6 summarizes the result. The table lists the program areas in order of the importance of the environmental quality goal to the program. The table shows that the goal of environmental quality as conceived by the respondent, was most likely to be considered very important to water and sewer, open space/recreation, and land use programs. Thus, of those engaged in these programs, 70-80 percent say environmental quality is a very important goal in these programs. It is least likely to be considered an important goal for historic preservation, noise, and design and appearance programs where only 30-40 percent of those engaged say environmental quality is a very important goal. Apparently, the problems of the man-made environment itself, represented by programs in noise, historic conservation, and appearance are not part of the environmental problem in the view of the sample agencies. Although interesting, these results are difficult to interpret without having a more precise and constant definition of environmental quality than was allowed the respondents by this survey.

Environmental Expertise on Planning Staffs

As a final measure of a planning agency's general orientation to environmental issues the questionnaire asked about the presence of personnel with training in environmental fields on the agency's staff. Table 4-7 shows the number of agencies within each agency type, which have at least one person trained in the environmental field listed in the left column. The total number of agencies of each type and the average

TABLE 4-6

PROPORTION OF AGENCIES ENGAGED IN VARIOUS PROGRAM AREAS AND THE ASSESSMENT OF IMPORTANCE OF ENVIRONMENT QUALITY GOAL TO THE PROGRAM

(all Figures are percentages)

Program areas	Relative importance of environmental quality goal for the program if agency is engaged in the program			Proportion of sample agencies engaged in program
	Very Important	Moderately Important	Slightly or not import.	
Water & Sewer	80%	19%	1%	68%
Open space/ recreation	74	21	5	97
Land Use	71	25	4	98
Solid wastes	60	35	5	57
Air quality	54	32	14	19
Redevelopment	53	30	17	49
Transportation	48	39	13	80
Industrial Development	47	38	16	58
Housing	44	39	18	83
Design & Appearance	37	48	16	67
Noise	34	46	20	31
Historic preservation	34	40	26	51

number of planners on their staff is displayed at the bottom of the table for comparison with the figures in the body of the table.

Only a small minority of agencies have personnel trained in an environmental field other than architecture and landscape architecture. Even in these more traditional environmental design fields, over half the agencies have no one. Thus while there are indications of increasing recognition of environmental quality as a concern for local and metropolitan agencies and increasing activity in planning agency work programs, few agencies are able to back up this increasing concern and activity with staff trained in environmental fields.

In summary, the following four points can be made about the general orientation of local and metropolitan planning agencies to environmental quality:

1. Environmental planning, to local and metropolitan planning agencies, is interpreted as the integration of man-made and natural systems. This interpretation suggests an inclination toward searching for a balance among multiple objectives, only some of which are environmental, and a disinclination to give up the traditional bias toward urban values altogether. In central cities and other cities in metropolitan areas, environmental planning is also often interpreted as "designing urban environments for human use." Environmental planning is seldom defined as anti-pollution planning or as the protection of ecosystems in any of the five types of planning agencies surveyed.

2. There is definitely a growing concern for environmental quality in local and metropolitan agencies, but it is only a recent phenomenon, tending to follow the general national awareness rather than lead it. In addition to the problems of building staff competence we suspect that the local political climate through the sixties, within which planning is practiced, provides some of the reason for this lag.

3. This increasing commitment at the local and metropolitan levels is demonstrated by (a) a large proportion of agencies which are establishing distinct work programs in environmental planning, and even more commonly, (b) the addition of environmental quality as a goal within traditionally common planning programs at the local level -- land use, water and sewer, and open space/recreation. Even those separate and distinct programs being established in

TABLE 4-7

NUMBER OF AGENCIES HAVING PERSONNEL TRAINED IN ENVIRONMENTAL FIELDS

Environmental Fields of Training	Metropolitan Areas				Number of non-metro city & county agencies
	Number of Metropolitan-regional agencies	Number of Central City agencies	Number of other municipality agencies	Number of County Agencies	
Architecture/urban design	17	21	17	9	8
Landscape architecture	15	13	10	11	9
Environmental sciences/ engineering	13	8	4	4	3
Environmental planning	6	3	2	8	2
Ecology/natural sciences	2	8	3	3	2
Environmental health	0	1	0	0	0
Total number of agencies in sample stratum	40	33	40	29	36
Average size of professional staff	10	12	5	6	4

environmental planning within these agencies tend to feature land use, water and sewer, open space and solid waste management rather than programs in noise, historic preservation, design and appearance, or even air quality, all of which would seem to be just as directly aimed at environmental problems.

4. The clearly increasing concern and level of environmental planning activity is not yet backed up with staff personnel, trained in environmental fields.

Implementation of Environmental Quality Objectives

In addition to environmental planmaking activities, implementation devices and problems are important concerns in the pursuit of environmental quality objectives. The discussion below deals with the range of controls, incentives, and other devices used by local government, sources of information and backup studies used in their formulation, and the effectiveness of these devices in actually achieving environmental quality.

Effectiveness

Regulatory tools Table 4-8 sums the sample respondents' assessment of the effectiveness of various regulatory tools in achieving environmental quality. The types of regulatory tools have been listed in approximate order of their rated effectiveness taking into account the proportion of agencies which rated a tool as "very effective," the proportion of agencies which rated it at least "moderately effective," and the proportion of agencies which rated it "not effective." The most effective tools are at the top of the list and the least effective at the bottom. The figures in parentheses following the description of each regulatory tool indicate the percentage of agencies in jurisdictions where each tool is used. Only those agencies in jurisdictions which used a regulatory tool rated its effectiveness.

The most effective regulatory tools for achieving environmental quality, according to the sample respondents in metropolitan and local planning agencies, are burning ordinances, subdivision regulations

TABLE 4-8

REGULATORY TOOLS LISTED IN ORDER OF EFFECTIVENESS IN ACHIEVING ENVIRONMENTAL QUALITY*

(most effective are at top of the list)

Type of control (% of agencies using it)	Percentages of Respondents using the tool and rating the tool as:			
	Very Effective	Moderately Effective	Slightly Effective	Not Effective
Most Effective				
Burning ordinance (68%)[a]	46%	36%	16%	2%
Burying utility lines req't. in subd. ordinance (48%)	43	39	16	1
Subdivision regulations generally (86%)	34	46	18	2
Planned unit development (75%)	44	37	16	4
Public water & sewer req's of subd. regs. (75%)	45[b]	31	20	4
Flood plain zoning (42%)	40	35	24	2
Less Effective				
Conservation easements (13%)	29	48	24	0
Historic preservation controls (24%)[c]	32	41	27	0
Marshland controls (19%)	33	58	3	6
Historic district zoning (23%)[c]	29	41	29	0
Effluent ordinances (47%)	33	58	3	6
Health/sanitation ordinances (78%)	32	44	22	3
Special district zoning, generally (32%)[d]	21	60	17	2
Density zoning (57%)	27	47	24	2
Dedication of open space req'ts of subd. regs. (58%)	33	37	25	5
Preservation of trees req'ts of subd. regs. (37%)	31	37	26	6
Performance standards (43%)	23	53	18	6
Emissions ordinance (46%)	25	51	19	6
Tree ordinance (25%)	19	48	31	2
Utility & other easements (66%)	35	33	21	11
Sedmentation/erosion controls (25%)	13	54	33	0
Building ordinance (83%)[e]	30	34	26	9

TABLE 4-8 (continued)

Least Effective				
Large lot zoning (2+ acres) (32%)[f]	22	50	20	9
Excavation controls (49%)	17	45	36	3
General zoning ordinance (90%)	14	56	26	5
Appearance ordinance (13%)[g]	9	50	41	0
Sign ordinance (72%)	15	43	36	6
Special use/variance mechanisms (84%)	21	41	25	14
Agricultural zoning (40%)[h]	18	32	36	15
Housing codes (73%)	12	50	26	12
Noise ordinance (30%)[i]	13	23	47	17
Litter ordinance (57%)[j]	11	38	40	11

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*Order has been determined by considering the percentage of responses in "very effective" category, number in "very effective" plus "moderately effective" categories, and percentage of response in "not effective" category.

[a] Principal cities of SMSA's much more likely to use a burning ordinance (88%); and counties much less (46%)

[b] Municipalities in SMSA's more likely to rate public water and sewer requirements within subdivision regulations as a very effective tool.

[c] Principal cities of SMSA's more than twice as likely as others to use historic districting (47%) and historic preservation controls (56%)

[d] Principal cities of SMSA's twice as likely to use special district zoning (56% vs 20 to 30%)

[e] Municipalities in SMSA's more likely to use building ordinances (95%) than other jurisdictions

[f] Municipalities in SMSA's much less likely to use large lot zoning (10% vs. 50% for other agency types)

[g] Non-principal cities in SMSA's are 3 times as likely to use appearance controls (28% vs. 8% for other agency types)

[h] Municipalities in SMSA's less than half as likely to use agricultural zoning (20% vs. 50%)

[i] Municipalities in SMSA's more than twice as likely to use noise ordinances, (45% vs. 18% for other agency types)

[j] Principal cities of SMSA's more likely to use litter ordinances.

(especially those with clauses calling for burying utility lines and those linking subdivision approval to policies about the provision of public water and sewer), planned unit development regulations, and floodplain zoning. The least effective regulatory tools in achieving environmental quality were litter ordinances, noise ordinances, housing codes, agricultural zoning, special use permits and variances, sign ordinances, appearance ordinances, the general zoning ordinances, excavation controls, and large lot zoning.

Incentives, public investment, and information/advice approaches Similar questions were asked and analyses made of the effectiveness of other action instruments in the guidance system -- namely incentives, public investment and information/advice instruments. The results are summarized in Table 4-9, organized along the same rules as the previous table. Open space acquisition, parks and recreation facilities, sewer and waste water treatment facilities, utility expansion policies and water supply development are the more effective guidance instruments for achieving environmental quality according to the respondents in our sample. The package of information/advice instruments, including various review processes are rated the least effective.

Information and Studies Used in Determining The Substance of Implementation Instruments

One indication of the nature and extent of environmental consideration in implementation instruments is provided by a review of the information and studies used in determining these instruments. Respondents were given a list of studies and sources of information and asked to check those used directly in determining the substance of their controls, incentives, and capital investments. The results are summarized in Table 4-10 for regulatory instruments and Table 4-11 for capital investments and incentives. The percentages in the bottom row of the table are averages of the percentages in the column above. The more often used studies are on the left and the least often used are on the right.

Federal and state guidelines and the general land use plan are important in determining all three groups of guidance instruments. In addition, model codes play an important role in determining regulatory instruments. The remainder of the studies and sources of information lag far behind these three in the extent of their application to guidance instruments. Among those least frequently used are various types of specifically environmental studies such as environmental impact studies, comprehensive environmental studies, river basin studies, deterioration studies, cultural resource studies, and ecological studies. Even soils, geology, and floodplain studies, the most commonly used of the natural environmental studies, lag far behind the top three.

Several interpretations of the data are possible. Perhaps the special environmental studies are too new to have attained widespread use. Perhaps planning agencies don't use special studies of any kind. Or perhaps local agencies don't yet feel these special studies are crucial to the design of guidance instruments. Of course, these statements are purely speculation -- no evidence exists to back them up. At any rate, the data in these tables suggest either one or both of two strategies to increase the utilization of environmental information in the determination of guidance instruments if that were to become an objective:

(1) increase the environmental bases of the three types of studies and information sources already used extensively, namely the land use plan, model codes, and federal and state guidelines; and/or

(2) encourage wider use of environmental information as direct inputs into the determination of implementation instruments.

Influencing Factors in Raising Environmental Issues and in Implementing Agency Recommendations

What have been the most important influences in raising environmental issues in the various planning programs of local and metropolitan agencies? And what factors influence the implementation of planning agencies' recommendations for achieving environmental objectives? Both questions were pursued in the sample survey.

TABLE 4-9

INCENTIVES, CAPITAL INVESTMENTS, INFORMATION/ADVICE TOOLS LISTED IN ORDER OF EFFECTIVENESS IN ACHIEVING ENVIRONMENTAL QUALITY

Type of Incentive	Percentages of agencies using the incentive and rating its effectiveness			
	Very Effective	Moderately Effective	Slightly Effective	Not Effective
Incentives[a]				
Utility extension policies (32%)	35	47	18	0
Bonus clauses in zoning (31%)[b]	14	52	28	6
Capital Investments				
Open space acquisition (77%)[c]	49	34	16	1
Parks & recreation facilities (89%)	43	38	16	1
Sewer & waste water treatment (77%)	37	43	17	4
Water supply development (65%)	30	40	27	4
Renewal projects (57%)[d]	26	43	28	4
Solid waste management (72%)	25	50	20	5
Highways & public transportation (74%)	15	35	38	12
Information Advice				
Advisory review functions (69%)	25	47	26	1
Inter-agency coordination (88%)	20	53	25	2
Informal review (60%)	18	52	29	2
Citizen education programs (55%)	20	41	36	3
Mass media (75%)	15	50	32	4
Environmental impact statements (50%)	18	45	30	7
Citizen participation (76%)	17	43	38	2
A-95 review (70%)[e]	20	41	29	10

Footnotes for Table 4-9

[a] Differential property tax, compensatory payments and differential utility charges were listed in the questionnaire but only 13, 6, and 3 agencies used these three tools respectively. Thus, they are not included in this table.

[b] Bonus clauses were three times more likely to be used by the municipalities in SMSA's than by the other agency types (50% vs. 16%).

[c] Open space acquisition, parks and recreation facilities, sewer and waste water treatment and water supply development are less likely to be used by counties outside SMSA's.

[d] Renewal projects are less likely to be used by county agencies.

[e] A-95 much more likely to be used by agencies in metropolitan areas, especially the metropolitan-regional agency (97% vs. 49% for counties outside metro areas).

TABLE 4-10

PERCENTAGES OF AGENCIES USING SPECIFIC INFORMATION AND STUDIES
IN DETERMINING REGULATORY INSTRUMENTS

Regulatory Device	federal/state guidelines	model codes	general land use plan	visual surveys	soils & geologic studies	flood plain studies	state or regional plans	urban design studies	ecological studies	monitoring programs	environmental impact studies	river basin studies	comprehensive environ. studies	deterioration studies	cultural resources studies
Burning ordinances	56	26	2	10	1	2	14	2	4	17	5	3	1	1	1
Burying utility lines, req't in subd. ord.	21	25	26	14	11	6	13	11	6	4	6	3	4	1	1
Subdivision regulations generally	36	45	42	14	26	18	15	12	6	5	6	8	6	3	2
Planned unit development	21	42	57	19	20	19	13	25	12	2	13	8	7	5	4
Public water and sewer req'ts,subd. ord.	44	20	28	9	28	13	27	9	10	10	9	15	8	3	2
Flood plain zoning	37	19	43	22	38	83	21	5	19	6	5	37	6	2	2
Conservation easements	32	27	57	36	41	23	18	14	32	14	32	23	23	9	14
Historic preservation controls	38	27	22	27	0	3	16	24	3	11	0	3	8	11	27
Marshland controls	45	13	29	29	45	36	13	7	23	10	13	16	10	7	3
Historic district zoning	26	26	31	49	3	9	6	31	0	9	0	3	6	23	43
Effluent ordinances	69	22	8	6	7	3	24	4	14	17	14	11	3	3	3
Health/sanitation ordinances	59	29	8	11	9	5	19	3	6	21	9	5	3	4	2
Special district zoning, generally	16	22	49	22	20	18	7	13	18	2	7	9	13	7	4
Density zoning	15	35	69	20	21	16	8	31	9	6	12	9	9	11	6

TABLE 4-10 (continued)

	federal/state guidelines	model codes	general land use plan	visual surveys	soils & geologic studies	flood plain studies	state or regional plans	urban design studies	ecological studies	monitoring programs	environmental impact studies	river basin studies	comprehensive environ. studies	deterioration studies	cultural resources studies
Dedication of open space req't,subd. ord.	31	24	51	23	22	21	22	12	13	3	10	9	10	5	6
Preservation of trees, subv. ord.	12	22	22	34	10	7	5	5	15	5	9	3	3	3	3
Performance standards	33	53	15	11	3	3	6	6	6	6	6	2	2	3	2
Emissions ordinance	68	29	3	7	1	1	23	3	3	21	4	1	3	1	1
Tree ordinance	7	32	12	29	10	2	7	17	7	10	15	2	7	2	5
Utility and other easements	23	19	23	7	7	4	12	7	3	6	3	5	4	2	2
Sedimentation/erosion controls	34	24	26	16	47	13	13	8	11	5	8	8	8	3	5
Building ordinance	48	66	8	9	7	6	8	2	1	5	2	3	1	6	1
Large lot zoning (2-plus acres)	17	17	73	25	42	19	10	17	21	6	10	6	10	8	8
Excavation controls	26	28	19	15	24	7	10	1	4	5	8	3	4	0	0
General zoning ordinance	22	45	83	42	26	29	22	25	8	7	10	9	7	10	5
Appearance ordinance	13	29	29	42	8	8	8	29	8	13	8	8	8	8	8
Sign ordinance	19	43	24	31	1	2	6	19	1	4	3	2	3	4	1
Special use/variance mechanisms	15	33	38	26	10	9	6	13	5	5	8	2	4	3	2

TABLE 4-10 (continued)

	federal/state guidelines	model codes	general land use plan	visual surveys	soils & geologic studies	flood plain studies	state or regional plans	urban design studies	ecological studies	monitoring programs	environmental impact studies	river basin studies	comprehensive environ. studies	deterioration studies	cultural resources studies
Agricultural zoning	14	21	65	26	49	23	14	8	16	5	9	7	11	5	4
Housing codes	56	64	13	19	4	5	6	6	1	10	4	1	2	19	2
Noise ordinance	36	38	11	2	2	2	9	4	2	11	11	2	2	4	2
Litter ordinance	33	24	5	16	2	4	8	4	4	8	5	2	4	4	2
Average of percentages in each col.	32	31	31	21	17	13	13	12	9	8	8	7	6	6	5

TABLE 4-11

PERCENTAGES OF AGENCIES USING INFORMATION AND STUDIES IN DETERMINING CAPITAL INVESTMENTS AND INCENTIVES

Implementation device	general land use plan	federal/state guidelines	state and regional plans	visual surveys	urban design studies	soils and geologic studies	flood plain studies	environmental impact studies	ecological studies	model codes	comprehensive environ. studies	river basin studies	monitoring programs	deterioration map	cultural resource studies
Capital Investments															
Open Space acquisition	73	58	40	43	17	23	34	11	20	4	17	11	4	7	12
Parks & recreation facilities	71	49	39	35	17	17	20	9	15	5	12	9	5	5	15
Sewer and waste water treatment	39	69	49	10	12	22	11	22	20	10	12	22	22	2	3
Water supply development	40	59	43	8	10	25	10	14	17	6	9	20	12	2	4
Renewal projects	60	72	23	31	35	10	10	12	9	11	13	5	5	38	13
Solid wastes management	40	66	38	18	8	28	11	17	17	10	7	8	11	1	3
Highways and public trans.	61	67	57	20	20	18	10	28	10	8	8	5	9	4	6
Incentives															
Utility extension policies	62	17	23	13	17	21	15	9	6	13	11	6	4	2	2
Bonus clauses in zoning	49	4	7	13	42	2	2	0	0	47	7	0	2	2	0
Avg. of percentages in each column	55	52	35	21	20	19	14	14	13	13	11	10	8	7	6

What influences are important in raising environmental issues within planning programs? The answers to this question are summarized in Table 4-12. The figures in the cells of the table are the percentages of those agencies engaged in the program area (row) and nominating the influence (column) as being important in raising environmental issues in that program area. The percentages in the bottom row of the table are the average of the percentages in the column above. These average percentages were used to arrange the influences in order of apparent descending importance, the most important on the left and the least important on the right.

The table suggests that staff attitudes and ideologies are the most consistently important influence in raising environmental issues across the full range of program areas. Local groups -- special interest groups, commissions, legislative bodies, and advisory groups -- are a second category of strong, widespread influences. It is noteworthy that these first two categories are local in origin. The third type of influence is federal/state guidelines and regulations. They are particularly, and expectedly, important in water and sewer programs (with federal funding), air quality programs, solid waste management programs, housing, open space, transportation and redevelopment, all areas where the federal government has urban programs.

Environmental impact statements, crises, programs of other communities and law suits and other court actions are all relatively unimportant influences on the local scene currently according to our respondents. We had hypothesized that they would be significant and certainly expect them to increase in importance over the next few years.

What impact do various factors have on the implementation of an agency's recommendations for achieving environmental objectives? The respondents' answers to this question are summarized in Table 4-13. The list of factors has been organized so that the more positive factors are in the top group and the least positive in the bottom group. Within each of the three groups, the factors are again ordered by degree of positive impact so that those at the bottom of each group have less

TABLE 4-12

MOST IMPORTANT INFLUENCES IN RAISING ENVIRONMENTAL ISSUES

(Figures are percentages of those engaged in program area (row) nominating the influence (col.) as being important in raising environmental issues for that program area.)

	Staff attitudes and ideologies	Local special interest groups	Local commissions	Federal/state guidelines or	Local legislative bodies	Advisory groups	Public opinion	Media exposure	Federal/state incentives	Environmental impact statements	Professional/scientific literature	Professional colleagues	Consultant inputs	Local crisis	Feedback from previous projects	Programs in other communities	Environmental monitoring	Law suits and other actions	Natural catastrophes/crises
Land use	53	42	33	20	20	13	30	17	10	14	9	15	12	14	15	5	4	5	7
Open space/recreation	46	39	31	26	24	28	28	12	18	11	9	10	8	2	8	7	4	2	4
Housing	36	39	23	37	21	27	22	13	21	13	13	10	6	14	10	10	3	3	0
Transportation	35	31	30	31	24	26	25	19	24	24	10	13	11	14	12	5	2	5	2
Water and sewer	35	23	25	59	32	17	25	21	33	18	8	11	14	27	5	5	15	8	8
Design and appearance	53	22	33	4	20	24	14	10	2	2	12	15	9	3	9	9	3	0	0
Industrial development	34	45	31	6	31	30	14	10	6	4	13	9	8	6	5	10	0	0	0
Solid wastes	21	21	26	48	39	21	20	17	19	17	12	7	14	17	10	10	10	2	3
Historic preservation	39	49	28	6	16	30	13	21	10	6	7	8	7	2	3	6	0	1	0
Redevelopment	37	33	43	27	37	30	20	14	24	10	11	10	20	5	14	15	0	4	3
Noise	40	17	29	21	29	19	25	14	8	14	12	10	10	6	8	8	4	6	2
Air quality	42	33	24	67	27	27	42	21	9	12	15	12	3	15	6	12	27	18	9
Average of percentages in each column	41	33	30	29	27	24	23	16	15	12	11	11	10	10	9	9	6	5	3

TABLE 4-13
Relative Impact of Various Factors on Implementation of Agency's Recommendations for Achieving Environmental Quality

Factors	Strong Positive Impact	Positive Impact	No Impact	Negative Impact	Strong Negative Impact
	Percentage of agencies rating degree of factor's impact on implementation				
Most Positive Factors					
Staff expertise	29%	65%	4%	1%	1%
Local legislative body	27	55	11	6	1
Federal/state guidelines and regs	24	56	18	3	0
Federal/state financial support	25	52	20	4	0
Lay commissions	21	59	19	1	0
"Public" environmental interest groups	23	47	25	3	1
Less Positive Factors					
Line agencies	12	58	24	5	0
General citizens' support	15	54	27	4	0
Community leadership support	17	50	27	6	0
Status of planning methodologies	12	55	30	3	0
Federal/state & regional planning assistance	13	53	30	4	0
State enabling legislation	16	51	22	8	3
Trends in legal actions & court decisions	16	43	37	3	1
Least Positive Factors					
Neighboring governments	3	42	46	9	1
Community goals other than environmental	6	47	35	10	1
Federal programs & policies (other than environmental)	10	36	39	13	1
Local financial resources	11	36	33	16	4
Other special interest groups	7	41	34	18	1
Distribution of responsibility among agencies within local government	3	34	42	20	1
Distribution of responsibility among local governments	2	25	44	22	7

positive impact (more negative impact in the case of the bottom group) than those at the top.

The results are parallel to the previous table on raising environmental issues. That is, the factors having the most positive impact on implementation are virtually identical to those rated important in raising environmental issues for the planning agency in the first place: staff (expertise this time compared to attitudes and ideologies in the previous table); three of the same four local groups (legislative body, environmental special interest groups, lay commissions); and federal/state guidelines and regulations and financial support.

These analyses imply that local influences are more important than outside influences. Staff and various local groups dominated the list of the most important positive factors. Federal guidelines and regulations and financial support, although important, are apparently not the determining factors in local mainstream environmental planning and implementation practice. Furthermore, three local factors -- local governmental fragmentation, the distribution of responsibility among agencies within local government and local financial resources -- had the greatest negative impact. Federal and state planning assistance and state enabling legislation are seen as relatively neutral factors currently. These findings suggest an environmental policy by both local and higher levels of government to encourage the local positive influences (planning staff expertise and awareness of local groups) while either changing or overcoming the negative factors (governmental fragmentation and financial limitations).

Intergovernmental Relationships in Environmental Planning and Implementation

Local government, of course, must function within a framework of regional, state and federal governmental agencies and legislation. Respondents were asked for their judgment about the effect of this governmental framework on their local level planning and implementation of environmental quality objectives. They were also asked more specifically about the role of local government and its planning agencies in promoting environmental quality.

The Effect of Federal Legislation, Organization or Administration

Respondents were asked the following open-ended question:

> Which federal legislation and organizational or administrative changes have had the most significant effect, positive or negative, on your agency's planning and/or implementation of environmental quality objectives?

Table 4-14 summarizes the results of tabulating and classifying the answers to this question.

Although 45 of 195 respondents did not answer this question, a number gave several answers so that there were 232 responses. Of these 232 responses, one-third were related to the National Environmental Protection Act of 1969, and one-third were related to the Department of Housing and Urban Development. The remaining third was split between the A-95 review process of the Office of Management and Budget and "other" responses. The Clean Waters Act, A-95 review requirements and environmental impact statement requirements, sometimes in conjunction with A-95 review, were the three specific responses mentioned most frequently. Together they accounted for nearly one-third of the responses.

Most responses referred to positive impacts, but not all. HUD, by far, received the greater proportion of negative responses; one-third of those mentioning HUD as having a significant impact reported that impact to be negative. Most of these negative comments concerned administrative problems.

The Effect of State, Regional Metropolitan or Local Legislation, Organization, or Administration

Respondents were also asked parallel questions about state, regional, metropolitan and local legislation, organization and administrative changes which have a significant effect on their agency's planning and/or implementation of environmental quality objectives. At the state level, 86 respondents mentioned some significant impact, but 99 mentioned no impact at all. In the group of 86 responses mentioning state impact, only water quality (29 responses) and wetlands (14 responses) recurred with any regularity. Together they accounted for 50 percent of the responses, however.

There was no pattern at all at the regional, metropolitan, or local level. The A-95 review process, initiated at the federal level and already mentioned in that discussion, was the only recurring nomination.

Perhaps the lack of any pattern to the regional, metropolitan, and local level impact should not be surprising. All respondents share a common federal context and all are referring to the same government at that level, whereas respondents are referring to a number of very different state, regional and metropolitan governments.

Adequacy of Existing Framework of Federal and State Environmental Legislation, Policies, and Activities

Respondents were also asked:

> Can environmental problems in your community be handled satisfactorily within the existing framework of federal and state environmental quality legislation, policies and activities or are further changes required at these higher levels? If so, what should the changes be?

The answers for the 155 respondents to this question were distributed as follows:

35 gave an unqualified yes, they can be handled satisfactorily within the existing governmental framework;

25 gave a "yes, but...(suggestion)" response;

77 gave suggestions for changes, implying dissatisfaction with the present framework;

18 gave a "no, because or until..." response.

The suggestions for changes can be grouped in two ways: (1) the particular higher level of government specified, and (2) type of change

TABLE 4-14

Responses about Federal Legislation, Agencies and Programs
Having a Significant Effect at the Local and Metropolitan Level

Responses related to the NEPA of 1969			77 (33% of 232 responses)
General, EPA	18	(23%)	
Environmental Impact Statements requirement for federally assisted projects	22	(29%)	
Clean waters act (generally the requirements for water quality)	22	(29%)	
Other: (NEPA generally, air quality regs., noise regs., area-wide planning requirements, financial assistance	15	(19%)	
Responses related to HUD			78 (34% of 232)
HUD General	20**	(26%)	
Open-space assistance	15	(19%)	
701 planning program assistance	10	(13%)	
Required certification of conformance to area-wide plans	8	(10%)	
Other: (housing programs, workable program, renewal program, FHA)	25***	(32%)	
OMB- A-95 Review requirements			30 (13% of 232)
Other responses: Federal aid generally Open space programs, DOT, BOR, Corps of Engineers, flood insurance, and so on)			47 232 (20% of 232)

* Percentages in right hand column are based on 232 responses.

** Of these 20 responses, 10 were negative in nature, mostly concerning administration problems with HUD.

*** Of these 24 responses, 8 were negative in nature.

suggested. The distribution of responses about suggested changes is shown in Table 4-15. They indicate that most suggestions were aimed at state government. A few were aimed at regional and local level in spite of the wording of the question which specified state and federal levels.

The most frequently suggested types of change, in order of frequency, were increased funds from higher levels of government mostly for local government; increased direct participation by higher levels of government; more regulations (very few suggested any other type of action instrument); better coordination among levels of government, among agencies at any single level and among programs within agencies; better administration of existing programs; and stronger enabling legislation by state government for local governments. Stronger enabling legislation by state government for local government is the single most often mentioned suggestion combining an action and a specific level of government.

The Role of Local Government and its Planning Agencies

In addition to their view of the impact and adequacy of higher levels of government, respondents were asked about the role of local government specifically:

> What does your agency see as the role of local government and its planning agencies in promoting environmental quality?

One hundred sixty eight respondents tended to fall into one or sometimes bridge across three modes of response:

1. Statements about the role of local government in relation to higher levels of government, stressing either the importance or unimportance of the local role or the distribution of responsibility between local government and other governmental levels;
2. Statements about particular elements of the comprehensive environmental planning program at the local level; e.g., land use, open space, urban design, water quality;
3. Statements about the stage or stages in the planning and implementation process that are suggested as particularly appropriate

TABLE 4-15
SUGGESTIONS FOR CHANGING INTERGOVERNMENTAL FRAMEWORK

Type of Suggested Change	Level of Government Mentioned						
	Federal	State	Regional	Unspecified higher govt	Local	Not Mentioned	Total
Strong actions by Higher Government							
Stronger enabling legislation for local governments	0	11	-	0	-	0	11
Legislation making local action mandatory	0	3	1	0	-	1	4
More direct participation with power	2	7	8	1	4	0	19
Increased funding -- general mention	4	2	0	7	0	3	14
Increased funds for metro or local agencies	3	5	0	9	0	0	14
Administrative Improvements							
General (less red tape, clearer, uniformity, etc.)	2	1	0	6	1	2	11
Coordination (between govs, agencies, actions)	7	6	2	3	1	0	12
Increase commitment and desire	1	0	0	1	4	2	8
Better enforcement	2	1	0	1	1	2	5
Types of Actions							
Regulations	2	6	2	3	3	0	13
Increase public and legislator awareness	1	1	0	1	2	0	4
Miscellaneous Other	11	19	1	6	3	8	
Column Totals	35	62	16	38	19	18	

> for local government, particularly planning agencies within local government, e.g., creating an awareness, implementing and enforcing controls, assessing environmental impacts.

Local government's role in relation to higher levels of government In the first of these three modes of response, the respondent is making a statement about the relative importance of local government's role and its relationship to other governments. These responses can be classified into one of three categories, as shown in Table 4-16. The table suggests that local and metropolitan agencies in our sample see an important role for local government in pursuing environmental quality. Only 13 percent see local governments as having a weak or very limited role, while 43 percent saw it as having a very strong role, even the leading role. Another 44 percent emphasized the partnership between local government and higher levels of government. A division of labor between governmental levels was suggested along two dimensions: (1) higher levels providing funding, objectives and standards, and guidelines while local government provides the implementation and enforcement of environmental programs as its part of the shared responsibility, or (2) higher levels of government concentrating on environmental issues that extend across local jurisdictional boundaries, usually citing air and water quality and perhaps solid waste and transportation issues, while local governments focus on land use, urban design, site planning and housing issues that do not extend beyond local jurisdiction.

Local government's role expressed as appropriate environmental topics and elements of a comprehensive environmental planning program Seventy six responses referred to particular environmental elements within the broad environmental planning field. Planning and control of land use and land development was the element mentioned most often (41 percent of these responses). The remaining 59 percent was distributed over a large number of topics including urban design (11 percent), open space, transportation, housing, flood plains, community facilities, historic preservation, noise, air quality, water quality, and solid wastes. One out of every four who nominated land use as a suitable role for local government would link it to environmental quality with such

TABLE 4-16

DISTRIBUTION OF RESPONSES ABOUT LOCAL GOVERNMENT'S ROLE IN RELATIONSHIP TO HIGHER LEVELS OF GOVERNMENTS

Category	Description & typical responses	Number of responses and percentage of total
1.	Emphasis on strong local role .... "total responsibility", extremely important", the most significant", "leadership role", "act independently", "most critical role", "primary role", "the center of any effort in promoting environmental quality", "absolute", "adverse environmental effects are due to local decisions or the lack thereof", "unless local governments take an active role in environmental programs, little will be accomplished"	31 (43%)
2.	Emphasis on Inter-governmental Level Partnership	32 (44%)
	a. unspecified in nature: "partnership"; "local government should be a part of decisions but not decide itself"; "both initiate own programs and endorse those of state and federal agencies"; "state-county cooperation". (12 responses, 17%)	
	b. specified some division of responsibility: "Local government is the 'door'. Financing and objectives have to be established at the federal or state level, but local governments get it done." "land use, housing and design (for local level) and air quality, water quality (at metro and state level)"; "local concern except where effects extend beyond the locality." (10 responses, 14%)	
	c. Emphasis on local role as simply the implementation of federal, state and metropolitan policies and areawide plans: "to implement and refine metropolitan plans and policies", "promote and implement federal and state regulations"; "implementation and enforcement tool for state and federal agencies, with little or nothing to say about these regulations." (10 responses, 14%)	
3.	Emphasis on weak, very limited role for local government "problem is not a local one"; "very limited"; "limited, due to state responsibility in this area"; "The county and lower units cannot do it...favor federal"; "(role" not defined"; "very little"; no consistent role."	9 (13%)
		72 (100%)

phrases as "guiding land use and development, taking environmental factors into account," or "protecting natural resources without discouraging development." In other words, local planners are saying that they are adding environmental factors and goals to the list of other factors in their land use planning programs, but not establishing specific environmental planning approaches separate from their already established planning values and activities.

This view is certainly consistent with "integrating man-made and natural systems," the predominant choice of a definition for environmental planning discussed above. Moreover, it could well be argued as an appropriate and potentially constructive role for the planning agency within local government, provided it is approached properly.

Local government's role expressed as emphasis on one or more stages in the guidance system planning and implementation process A third group of respondents expressed their answers in terms of stages in the planning and implementation processes. Nineteen respondents suggested planning as the most appropriate role of local government in a very general way without elaborating while 24 mentioned implementation without elaboration. A number of others nominated one or more specific stages in the planning and control processes. One hundred seven such nominations were made and are summarized in Table 4-17. These were evenly split between planning and implementation. The most common planning oriented responses were establishment of an awareness (mostly public awareness) of environmental problems and environmental planning and an assessment of environmental impacts. To our respondents, implementation almost always means regulations, standards, codes, ordinances and controls as opposed to a broader concept of guidance devices which would include public investments, incentives and advice as well.

Footnotes

[1] Israel Stollman, "The Awful Lot of Environment," Planning: A Newsletter of the American Society of Planning Officials, 36, No. 6 (July 1970).

[2] Thomas D. Galloway and Ronald J. Huelster, "Planning Literature and the Environmental Crisis: Content Analysis," The Journal of the American Institute of Planners, 37, No. 4 (July 1971), 269-273.

TABLE 4-17

DISTRIBUTION OF RESPONSES ABOUT LOCAL GOVERNMENT'S ROLE IN TERMS OF SPECIFIC ASPECTS OF PLANNING AND IMPLEMENTATION PROCESSES

Planning oriented responses (in addition to 19 who mentioned planning generally)		
Establishing an awareness	19	(18%)
Environmental studies	7	(7%)
Establishing goals and objectives	5	(5%)
Proposing solutions and policies	3	(3%)
Monitoring	5	(5%)
Assessing environmental impacts	13	(12%)
Total number mentioning specific aspect of planning activity	52	(49%)
Implementation or Control oriented (in addition to 24 who mentioned implementation generally)		
Regulations	49	(46%)
Other (easements, tax structure, public investments in community facilities)	6	(6%)
Total number mentioning a specific implementation technique	55	(51%)
Total	107	(107%)

PART III

PROMISING APPROACHES

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CHAPTER 5

LAND USE PLANNING: THE CORNERSTONE OF LOCAL ENVIRONMENTAL PLANNING AND CONTROL

Page

The First Front: Redefinition of Comprehensive Planning 98
- The Additive Approach 98
- Realignment of Objectives and Assumptions 102

The Second Front: Environmental System Information and Evaluation Criteria 106
- Natural Systems Inventory Analysis 107
- Ecosystem Analysis 112
- Visual Landscape Analysis 117
- General Remarks on Environmental System Inventory and Analysis 120

The Third Front: The Land Use Guidance System 120
- Stage 1: Problem Definition and Analysis 121
- Stage 2: Formulation of Decision Guides 124
- Stage 3: Generation of Specific Policy and Action Instruments 130
- Stage 4: Testing Alternatives 131
- Stage 5: Selection of Action Instruments 138
  - Control of the Spatial Location and Timing of Development 139
  - Coordination of Several Action Instruments 152
  - Control of Design Characteristics at the Site 155
- Stage 6: Feedback and Monitoring 158

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CHAPTER 5

LAND USE PLANNING: THE CORNERSTONE OF LOCAL ENVIRONMENTAL PLANNING AND CONTROL

The traditional approach to land use planning begins with a projection of future economic growth in the urban area,[1] based on trends in both the national and regional economies. It reflects the potential of the given urban area to capture a part of this total growth and, in some cases, the hopes of the community. This projection in amount and type of economic activity is used to estimate future population. These two projections are then translated into estimates of future land demand for industrial, commercial, residential, and public activities.

Land supply is evaluated according to suitability and capacity for these various activities. This is defined in terms of a land parcel's location or accessibility, size, availability of utilities, and general physical quality. Quality denotes environmental characteristics to a varying degree. Some traditional land use plans define environmental quality only with slope and soil characteristics as important cost constraints to development. For example, flat land and good bearing soil may be viewed as prime for intense use regardless of whether the site is located in a flood plain, possesses prime agricultural soil, or is presently a natural forest or wildlife preserve.

The basic assumption of this approach is that economic growth will bring positive benefits to the community and that such growth can best be fostered by designing the land use pattern to minimize development costs and maximize economic accessibility. Further related assumptions include (1) an unlimited supply of land suitable for urbanization exists; (2) a city is essentially for economic production and consumption and should be organized in a manner most efficient for such production and consumption activity; and (3) the negative effects of spatially organizing land use according to economic activity criteria can be assuaged,

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after they are discovered, through technological solutions which an economically productive society will be able to afford.

These assumptions came under scrutiny in the 1960's when the effects of land use planning's emphasis on economic system efficiency became evident. Pollution in urban areas was high and the cost of reducing it, where it was still possible through technology alone, was extreme. Many other forms of environmental degradation appeared more permanent. Rich natural areas and farm lands, long accessible amenities to urbanites and necessary ingredients to the American definition of a quality life, were rapidly disappearing as cities expanded through haphazard suburban sprawl across the rural fringe. Furthermore, the very effectiveness of planning characterized by long range master plans implemented primarily through zoning came under question.

In response to these criticisms, the land use planning process is now evolving along three distinct, yet intimately related, fronts. First, there has been a continual redefinition of the basic objectives and assumptions for the entire comprehensive planning process of which land use planning is so integral a part. Quality of the natural environment within and around the urbanized area has assumed more importance alongside the traditional concern for the quality of the manmade urban environment. The once basic assumption of comprehensive planning, that economic growth will bring positive benefits to the community, is being examined for potential negative liabilities. Projections of growth are no longer merely accepted or even encouraged as necessary preconditions for a desirable future for the community. They may be accompanied by, or even challenged by, a corresponding projection of environmental quality. Land use planning in a comprehensive planning framework is not merely the accommodation of an independently projected growth but is being redefined as an input in deciding how much, as well as where, growth ought to occur.

Secondly, there has been an expanding search for appropriate environmental information, interpretation methods and choice criteria on which to base an allocation of urban activities. This second front may be regarded as a way to facilitate the redefinition of comprehensive planning described as the first front. While the more traditional approach stressed data, models, and criteria for planning to maximize the efficiency of urban development and urban activity systems, the more recent approach emphasizes protection of the integrity of environmental systems.

Thirdly, the emphasis in land use planning has shifted away from interpretation of data and design of a long range master plan toward implementation. This third front increasingly emphasizes carrying planning activities, including the redefinition of comprehensive planning's objectives and assumptions and the new approaches to inventory and interpretation of environmental data from the first two fronts, through to implementation.

Together, the trends along these three fronts point to the evolution of a planning process aimed at interjecting public objectives, including most recently the environmental thrust, into the urbanization process. We have termed this cutting edge of land use planning, "Guidance System Planning," a concept defined in Chapter I.

At present, there is no consensus on the most appropriate approach to guidance system planning for environmental quality. There is no inherently correct way in which community goals and objectives should be established, no absolute definition of the type of information necessary for land use-environmental relationship planning; nor is there any one accepted interpretation of information. Furthermore, there is no agreement on the optimal mix and type of decision guides and action instruments which may be generated through this planning process. It is highly unlikely that there can or even should be such consensus. The appropriate character of guidance system planning for a given urban area should depend on problems encountered, community goals, needs of the decision-making body, degree to which public intervention in land development is accepted, and general level of planning resources available. The following discussion will not outline the ideal approach to guidance system planning for land use-environmental quality but rather will present some of the approaches currently being taken on each of the three fronts of innovation.

The First Front: Redefinition of Comprehensive Planning

There are two basic ways in which comprehensive planning is being redefined or reorganized to reflect environmental objectives. The first approach is to add a new sector to the total planning program which specifically focuses on environmental systems just as other sector planning emphasizes economic development, social policy, or transportation. Land use is viewed, within this new sector, from the perspective of its impact on environmental elements such as air, water, vegetation, and wildlife. To varying degrees, this approach simply involves adding new objectives to the list of more traditional land use planning objectives. The second approach involves a more fundamental realignment of comprehensive planning. An attempt is made to examine the relationships, both supportive and conflicting, among the objectives of the many urban systems and to develop some resolutions which will guide planning within the various sectors toward a more coordinated goal set.

The Additive Approach

The first approach, adding a new sector to comprehensive planning, parallels that taken at the federal level and by many states when a separate environmental planning sector, or even a separate agency, is established. The survey results described in Chapter 3 show that about 40 percent of the sample agencies had established environmental planning as a separate, special work activity. Some local units have even established environmental protection agencies. Traditionally, environmental protection at the local level has been the responsibility of public health agencies, whose efforts have been limited to population abatement and sanitation programs. More recently, they have tended to become involved in other problem areas, particularly land use and transportation, as they explore the root causes of problems such as air and water pollution.

However, creating a separate agency or planning sector to deal with environmental problems does not insure that environmental objectives will be respected by other public sectors and private groups who are making urbanization decisions. Thus, in addition to creating a new planning sector, there is now an emerging trend toward requiring an environmental impact statement on public and private development proposals at the local level. The environmental planning agency or sector is given primary responsibility for review of these statements. Although such a requirement does not prohibit projects which may be environmentally degrading, it does force disclosure and encourages consideration of possible environmental impact.

Huntington, New York, recently created a local environmental protection agency, which is involved in traditional pollution programs related to air, water, solid waste, noise, and pesticides as well as land conservation. The agency's creation was stimulated by the design, in the spring of 1972,[2] of an environmental planning program for the area by a group of graduate students in the Department of Regional Planning and Landscape Architecture at the University of Pennsylvania. The program involved an inventory of natural systems in the area. From this, areas for protection, remedial action, and redevelopment action were designated, and policy actions were recommended. Although the program design has not been formally adopted by the town or the EPA, agency personnel use its information, interpretations, and recommended policies when they are called upon to comment on the environmental implications of development proposals.

Huntington requires environmental impact statements to be submitted on all public development proposals, whether funded at the federal, state, county, or local level, and on industrial use and subdivision requests from individuals.[3] The agency further serves as a consultant on environmental implications of major public investments such as sewer system construction. However, since it was established only in January 1972, the agency has not yet had an opportunity to evaluate the town's annual budget priorities with respect to environmental implications. At this time, the Huntington EPA functions as a watchdog and advocate for environmental quality. The requirement for environmental impact statements is the primary formal procedure by which environmental objectives are interjected into the planning and development process.

Another example of the additive approach is Los Angeles. There the Department of City Planning is adding a new sector to the General Plan--

"An Environmental Conservation Element."[4] It should be noted that this element is mandated by the State of California in its Planning and Zoning Law.[5] In California, all cities and counties are required to adopt general plans which must contain nine elements: Land Use, Circulation, Housing, Conservation, Open Space, Seismic Safety, Noise, Scenic Highway, and Safety (non-seismic geologic hazards as well as floods and forest fires).

The new component of the General Plan represents a compilation of data from technical reports and interviews with personnel from various city agencies involved in environmental questions. Environmental issues are divided into six categories: air pollution; water quality; noise control; conservation of land and resources; solid waste disposal; and pesticides. The department notes that "while it is recognized that these categories are not mutually exclusive, their artificial separation is necessary if analytic chaos is to be avoided."[6]

The report, while providing the basis for the new element of the General Plan, is also intended to serve several secondary, yet perhaps more critical, functions.[7]

> These include (1) serving as a comprehensive framework through which the multitude of governmental and private agencies, citizen groups, etc. can perceive the interrelationships between various aspects of the environmental problem, (2) providing the specific policy recommendations needed for the formulation of additional standards and legislation pertaining to environmental quality, (3) presenting guidelines for the modification of City procedures so as to minimize the negative impact of City operations on the environment, and (4) as a general and comprehensive data source for information pertaining to various environmental questions in Los Angeles.

In California, environmental impact statements are required on all state and local development. The requirement for impact statements on local public development in California is not simply a requirement to disclose the predicted impact. Moreover, until recently, the California EQA also had required that all cities and counties "make a finding that any project they intend to carry out, which may have a significant effect on the environment, is in accord with the conservation element of the general plan."[8] In 1972, this section of the California Environmental Quality Act was deleted apparently because of the implications of the California Supreme Court decision determining that the law applied to private, as well as to public, development. (Assembly Bill 889, 1972).[9]

In the additive approach, illustrated by these examples, in Long Island and California, environmental objectives are examined separately from other community objectives. In a sense, they are simply added to existing community objectives. No explicit attempt is made to reassess community goals which may, by their very nature, frustrate the achievement of environmental quality. In short, the inherent conflict among objectives is not defined. State legislation, such as that attempted in California, requiring that all public projects and private development having significant impact be in accord with the local conservation plan which in turn is part of the general plan, represents a step toward resolving such conflict. Nevertheless, it can be argued that this conflict, to be resolved effectively, must be dealt with at a broader and more fundamental level than on a project by project basis, which, obviously, cannot be effected immediately. The California law is an important development and points the way to a more fundamental realignment of objective priorities.

In the case of Huntington, a specific agency is charged with the role of advocate for the environment, and impact statements are required on all public, as well as much private, development, although the impact need only be disclosed; there is no requirement that such development be conducted in accord with any environmental plan. Yet, this procedure does create an opportunity for environmental objectives to be given a voice at the bargaining table. While the Huntington approach to redefining comprehensive planning is based on a model of political bargaining, the California approach is founded on a more rational comprehensive planning model. Both examples illustrate the approach of adding environmental planning as a separate sector under the comprehensive planning umbrella.

Realignment of Objectives and Assumptions

The second approach to redefining comprehensive planning involves a more fundamental realignment of all community objectives in the light of a new awareness of environmental implications. Environmental quality is not viewed in any absolute terms so that an action program may be designed and added to existing programs to achieve specific standards related to various separate environmental system indices. Rather, environmental quality is viewed as an integral facet of broader goals related to the "quality of life," therefore requiring an exploration of all community objectives and their long-term environmental implications.

For example, Wayne County, Michigan embarked on a new approach to comprehensive planning in 1970 in which environmental quality was posited as one of the fundamental issues of urbanization. The "Comprehensive Planning Process for Wayne County" involves three basic steps.[10] First, current land use trends are evaluated with respect to impact on both the urban activity system and environmental system objectives. Local environmental trends are placed in the context of parallel national, and even global, trends to provide a sense of perspective necessary for explication of their broader significance. This trend analysis is not based on a comparison with current federal water and air quality standards as is the case of the Los Angeles study cited above.[11] Rather, the analysis focuses on broader ecological issues related to "population, depletion of energy resources, depletion of raw materials, despoiling of the environment, altering the make-up of the atmosphere, altering its temperature ...".[12] Such environmental analysis places the discussion of urbanization patterns and natural processes into a time frame of two or three generations.

The second step in the process is the generation of four alternative development strategies:[13]

1. "... aggregating the separate heretofore uncoordinated local master plans."
2. "... projecting national trends and then basing local prospects on some predetermined share of the total."
3. "... maximum growth as the Key to the future."

4. providing "... the opportunity for all to achieve their own definition of 'quality of life'. Maximizing the options available to all the citizens for achieving their preferred life style ..."

The third step, is the selection of a strategy and development of an implementation plan.

To a large extent, the redefinition of comprehensive planning for Wayne County begins with a rather complex process of long-range goal planning for the area. The data generated through the process are aimed at redefining the mind set which the public and its decision-makers bring to questions of urbanization, through creating an understanding of the complex and interdependent eco-system rather than by pointing to specific action recommendations.[14] The recommendations included in the volume on environmental quality go beyond simple delineation of land use policies because a thorough definition of the environmental system necessitated a more comprehensive view of the interface between urban activity and environmental support systems. For example, the recommendations included creation of an Environmental Policy Committee, improvement of ecological education, and a broad series of possible actions and policies to deal with the adverse environmental impact of urbanization. Some of the recommendations were:[15]

1. Establish an optimum population range for the county so that total spatial needs of the population can be met.
2. Program gradual steps to adjust the county's economy to the optimum of Population "A" above.
3. Urge transition of energy generation to other than fossil fuel sources.
4. Urge and require recycling of exhaustible materials.
5. Conserve land resources by erosion and sedimentation control ordinances at both municipal and county levels.
6. Develop jointly with the Chamber of Commerce and Economic Development Agencies, methods of identifying, reporting, and coping with non fiscal costs of pollution.
7. Periodically report public and private fiscal costs of pollution.

8. Adopt policies and methods (zoning and/or acquisition as examples) which preserve open land.

The Albuquerque-Bernalillo County Planning Department took a similar approach to redefining comprehensive planning goals. This department published a discussion of community goals within the context of long-term environmental system constraints.[16] The Comprehensive Plan, Metropolitan Environment Framework assesses past and future trends in environmental quality and poses two alternative growth strategies based on two different goal sets. The first option would require more stringent public controls of urban growth aimed at simply modifying the trends in degradation. The second approach is based on a fundamental departure from current trends to insure optimum long-term environmental quality. For example, under "Strategy 1," population growth would be limited to a 3 percent maximum annual increase, whereas under "Strategy 2" a population size limit would be based on local resource capacity, as yet undefined, but not on a modification of population growth trends. For land use policy, "Strategy 1" would require standards for location and control of development rates, while "Strategy 2" would call for actually improving land through land development practices. Essentially, this second strategy would mean that urban development should be compatible with ecologic principles of the environment. The report suggests that urban development follow the maxim, "Do As Well As A Tree," which would mean adoption of building and subdivision codes designed to "improve the envrionment as a result of land development [based on] oxygen generation requirements, soil development objectives, water purification code, geological specifications, microclimate modification goals, [and an] energy use and replenishment plan."[17] These implementation devices and the administrative procedures by which they are applied are not actually developed in the plan. Like the Wayne County study, the Albuquerque report is fundamentally an attempt to interject an ecological consciousness into the evaluation of community goals and urbanization processes.

These two orientations to the redefinition of comprehensive planning goals, represented on the one hand by Huntington and Los Angeles and on the other by Wayne County and Albuquerque, differ primarily in purpose. In the case of the first two examples, the intention is to develop an action program to achieve specific environmental objectives such as national standards for air and water quality. The time frame of such planning is short range and, the approach is disaggregated by individual environmental sectors. Population growth and other traditional basic land use planning assumptions are not questioned. In the second approach, the objective is more ambitious: to develop an understanding of the complex interdependencies among environmental systems and the relationship of urban man to the eco-systems in which he lives; to establish a sense of community purpose about a future mode of urban life; and then to develop an action program.

Actually, these two approaches need not be viewed as mutually exclusive. A local planning agency may be engaged in both a short-term, action oriented planning program aimed at specific environmental standards as well as a longer range and continuous reassessment of community direction. It may well be that, practically speaking, both approaches are necessary and should be undertaken simultaneously, despite their conflicts in theory. In a community with limited planning resources (as is always the case in the face of such overwhelmingly complex problems as the urban-environmental interface), a choice among priorities may be necessary and will be dependent upon (1) the existing status of specific local environmental quality indices; (2) development pressure; (3) the level of public and legislative awareness; and (4) national and state involvement in defining environmental objectives through standard-setting and procedural requirements. Since most urban areas have several public agencies with mandates for environmental planning, it would appear feasible for attention to be given to both short and long range planning. The crucial step would be to integrate the two functions in a meaningful manner.

The Second Front: Environmental System Information and Evaluation Criteria

To a certain extent, the second front of innovation in the land use planning process reflects a rediscovery and reinterpretation of natural processes as a fundamental constraint to urbanization. Planners have always been concerned with the natural environment as it posed constraints, particularly in economic terms, to urban development. More recently, planners have recognized that the environment is composed of a complex set of interdependent processes with a logic of its own. This natural logic or balance can not be disrupted by man's activity if the environment is to continue to provide essential life resources. This recognition has instigated a search for appropriate environmental system information for planning as well as for an appropriate interpretation of that information.

Recent approaches to defining an environmental system information base for planning may be viewed as reflecting three general schools of thought. The first focuses on an inventory of key natural subsystems in the planning area which pose constraints on or opportunities for urban development. The second approach is also based on an inventory of natural subsystems but emphasizes their interpretation as interdependent processes in the eco-system. The third approach also inventories key natural subsystems but interprets their significance in terms of man's visual perception of the environment. The three approaches may be respectively termed: natural system inventory analysis; ecosystem analysis; and visual landscape analysis. Since the three approaches are intimately related and since, in practice, all inventories and analyses interrelate to some degree, this distinction is somewhat imperfect. Regardless of the approach taken to resource analysis, the information generated may be used at various stages in the planning process.

To explicate the three approaches to resource analysis, a few examples of each will be presented, although no actual resource analysis fits exclusively into one category. Descriptions of the examples will be brief since a complete discussion of the various approaches to resource analysis is well beyond the limits of this study. The reader who is interested in this subject is encouraged to study the reports given as examples and the other references cited in footnotes. Two general references can also be recommended: Carl Steinitz's A Comparative Study of Resource Analysis Methods and Three Approaches to Environmental Resource Analysis by Raymond K. Belknap and John G. Furtado.

Natural Systems Inventory Analysis

The primary objective of this type of natural resource inventory is development of a natural features information base which may be used in the planning process as a rationale for determining optimal space allocations for land use. The central operating principle is that specific features of the natural environment are more suitable for some land uses than for others. Common environmental subsystems inventoried include geology, pedology (soils), hydrology, meteorology, climatology, plant associations, and fish and wildlife. Although most recent environmental resource inventories touch on some aspect of all of these subsystems, they vary in their specific focus and interpretation, depending on the reason for which the information is gathered. At present, there appear to be two fundamentally contrasting objectives: first, determining environmental constraints to development; and second, protecting the environment from development. The first objective places the highest priority on urban system demands partially excluding some environmental system demands while the second objective places highest priority on nature and its demands. Two contrasting examples are described here.

The study, The Natural Features of the Washington Metropolitan Area, prepared by the Metropolitan Washington Council of Governments is an example of an inventory conducted to determine environmental constraints to development.[18] The study focuses on seven natural features: geology, minerals, elevation, slope, soils, streams and drainage basins, flood plains, groundwater, and woodlands. Woodlands are the only plant associations identified, and its inclusion is justified on the grounds of aesthetics and amenity, conservation, and direct economic value as a commercial product. Fish and wildlife are not assessed.

These features were selected because of, and evaluated with respect to, their impact on urbanization. The analysis, biased as it may be toward protecting development rather than the environment, is thorough and provides useful information. For example, the list of the various geological system "items" and their relationships to urban development adapted from the report in Table 5-1, exhibits a strong development protection bias rather than a concern with environmental protection. Other natural features such as slopes, soils, and flood plains are similarly interpreted for appropriateness for various land uses.[19] All land uses postulated involve some type of human activity or production type. In this approach, no area is restricted for nature alone. The information is finally synthesized into a "natural features composite." The composite map "shows some of the areas where public policy should reflect the limitations or opportunities [primarily for economic gain] inherent in the physical environment: areas of shallow depths to bedrock; poor drainage areas; areas having mineral resource potential and areas where landslides, flood plains, and severe slopes occur."[20]

Although the stated purpose of the inventory was to assemble "natural features data [which] have not been available in a single document at a uniform map scale covering the entire Washington Metropolitan Area... for urban analysis in an 'ecological framework'," the data interpretation presented does not focus directly on the ecological objective.[21] Yet, since land does have an economic value which property owners usually desire to capture through sale and eventual development, this type of resource inventory which stresses major conflicts between natural features and urbanization may be realistic as well as useful. Furthermore, such information is necessary to insure sound development practices. This has been the emphasis in the traditional approach to the use of environmental data.

Since the publication of Design with Nature in 1969, the name Ian McHarg has become associated with the second and contrasting approach to environmental systems analysis--an approach emphasizing the protection of natural processes.[22] Although McHarg is only one of many environmental planners who take this stance to planning, his effective advocacy in the

Item	Useful in Determining
Topography	General land use suitability; potential development character; costs
Slope Stability	Areas of potential soil slippage; hazards
Foundation conditions	Foundation bearing quality or supportive strength
Relative drillability	Tunneling and boring capabilities affecting transportation and utilities
Excavation characteristics	Potential construction hazards; physical limitations and costs
Depth to bedrock	Physical limitations and costs
Groundwater features	General availability of water resources
Yield of wells	Economic feasibility of tapping groundwater resources
Permeability	General land use suitability; construction cost; health and welfare limitations
Septic tank suitability	Development costs; health and welfare limitations

TABLE 5-1 [a]

IMPORTANT RELATIONSHIPS OF GEOLOGY AND URBAN DEVELOPMENT recent environmental movement in land use planning cannot go unmentioned here. McHarg's environmental analysis of the Twin Cities Metropolitan Area serves well to illustrate an inventory and analysis of key natural systems for the primary purpose of their protection.[23] It is called an "ecological study," although, as will be discussed later, some ecologists would hesitate to call this approach an "ecological" analysis. The purpose of the study was to[24]

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[a] Adapted from list on page 7 of The Natural Features of the Washington Metropolitan Area (Washington, D. C.: Metropolitan Washington Council of Governments, January 1968).

> inventory phenomena and natural processes, to reconstitute these as a value system, and to perceive the degree to which land, air and water processes offer both opportunities and restraints to single and combined prospective land uses.

The list of phenomena inventoried are similar to those identified in the Washington study although plant associations and fish and wildlife are given specific attention here: climate; historical geology; bedrock geology; surficial geology; foundation conditions; economic minerals; physiography; hydrology (surface water and ground water); pedology; plant associations; fish and wildlife; and existing land use.

The distinction between the two inventory approaches appears in the interpretation phase:[25]

> The basic proposition employed [during the interpretation phase] is that any place is the sum of historical, physical, and biological processes, that these are dynamic, that they constitute social values, that each area has an intrinsic suitability for certain land uses, and, finally, that certain areas lend themselves to multiple co-existing land uses. [emphasis added]

That natural processes have social value is a fundamental assumption:[26]

> Absolute economic values cover only a small range of social values. By employing a relative system of most to least, it is possible to include all of the important social values and circumvent the economist's narrow pricing system. While this denies an illusory precision of cost-benefit analysis, it does show the maximum concurrence of positive factors or their relative absence.

Given this, the major environmental systems inventoried are evaluated with respect to suitability for four major land use groups, each of which includes several land uses:[27]

1. Production. Land uses related to production of the land and include: agriculture, forestry, wildlife propagation, and mineral extractive industries.
2. Protection. Land uses having primary purposes to preserve, protect, and conserve those elements of the natural environment considered to be unique, scarce, or vulnerable or constitute a hazard to life and health. Such resources may include erodible slopes, flood plains, and recharge areas.
3. Recreation. Land uses with primary purposes for the constructive use of leisure time in an active or passive manner.
4. Urbanization. Land uses related to residential, commercial, institutional, and industrial developments.

Attributes of each environmental subsystem are ranked on a scale of one to five, one being most desirable and five being least desirable, for each land use category. Using geology and its relevance to urbanization as an example: bedrock, flat land on sands and gravels, flatland on drift, sloping land on sands and gravels, sloping land on drift, and alluviam, lake deposits, eskers and kames, are given successively lower values as foundation materials.[28]

Next, natural phenomena and processes are incorporated into suitability classes. A table for each environmental subsystem comparing its relevance to specific land uses within the four land use groups is developed. The individual environmental subsystem tables are then combined to map the overall intrinsic environmental suitability of each specific land use (for example, production involves agriculture, forestry, wildlife production and extractive minerals). Finally, a synthesis map of prospective land uses is prepared reflecting the relative importance of each land use. Ranking could vary according to the objectives of the community. The rank order selected in the Twin Cities was protection, urbanization, agriculture, active recreation, forestry, and extraction.

The inventory and analysis for the Twin Cities area represents one of the earlier studies by the McHarg group. Since then, the specific methodology for interpretation of data as well as the data collection process has been revised and improved.[29]

The Twin Cities study is only one example of the approach to environmental systems inventory and analysis which places a priority on the protection of natural features determined to be of value because of their scarcity, uniqueness, historical significance, or importance to sustaining other processes or elements. Many other examples of studies conducted by local planning agencies, private consultants, and academicians would need to be described to present a complete picture of the subtle variations to this approach which have been developed.[30] Environmental system analysis and interpretation is only one stage in the land use planning process, but it is an extremely important planning activity which is presently receiving a great deal of attention.

Ecosystem Analysis

The second approach to environmental system inventory and analysis differs from the first primarily in the degree of integration of the separate natural systems into an ecological whole and a greater stress on biological components. In its simplest terms, the ecosystem concept states that the earth operates as a series of interrelated systems within which all of the components, living and non-living, are linked with one another in complex ways so that a change in any one component will bring about some corresponding change in the operation of the whole system. An ecosystem approach to environmental inventory stresses the interrelationships among components rather than treating each natural phenomenon as a separate characteristic of the landscape. Figure 5-1 indicates the general pathways of interrelation or influence among the natural phenomena that may be considered separately in the first type of inventory.

One of the more significant aspects of ecosystems in land use planning is that they are the real functional units of the natural world and can be identified on the ground. Thus, they form logical operating units for an environmental plan or guidance system. The soil scientist

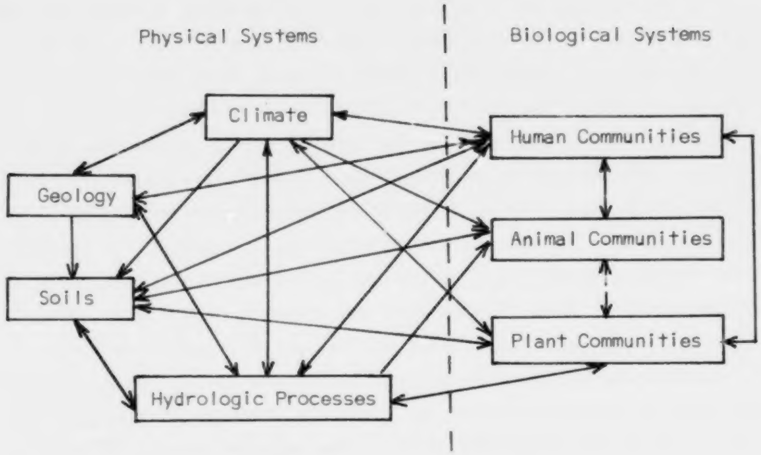


FIGURE 5-1

THE INTEGRATION OF NATURAL PROCESSES INTO AN ECOSYSTEM. ARROWS INDICATE THE DIRECTION OF INFLUENCE, MANY OF WHICH ARE RECIPROCAL.

J. S. Rowe has defined an ecosystem as "... a topographic unit, a volume of land and air plus organic contents extended areally over a particular part of the earth's surface for a certain time." This definition stresses the reality of ecosystems as functional units of the landscape that include all natural phenomena and that can be identified and surrounded by definite boundaries. The boundaries of ecosystems, however, are never closed or impermeable; they are open to transfer of energy and materials to or from other ecosystems. The open nature of ecosystem boundaries is important, for even though a planner may be dealing with a particular ecosystem as a land unit he must keep in mind that the exchange of materials with its surroundings is an important aspect of the system's operation.

The ecosystem approach to natural system analysis could be applied at any level of planning--regional, local, or site-specific--depending upon the size of the ecosystem chosen. The regional level, such as that of large watersheds or river basins, would seem to be most appropriate, since an analysis at too small a scale would be likely to leave some of the significant relationships outside of the system.[31] Due to the complexity of such large ecosystems, however, applications of this method to date have been restricted to much smaller areas. At whatever scale of planning it is used, the ecosystem approach always emphasizes relationships between processes at that scale and processes of the larger systems which encompass it.

Ecosystem-based inventories usually stress the plant and animal communities of the planning area. This is partly because a complete analysis of the exact nature of the complex interrelationships would be a massive undertaking, but it is also because the biotic communities are a fairly accurate reflection of the total effect of all other environmental influences. By delineating and describing plant communities, for example, an ecologist familiar with the area can derive a reasonably accurate picture of the condition of surficial rock strata, soils, microclimate, hydrologic regimes, and the animal communities likely to be present. The stage of succession of a plant community can tell much about the length of time since it was last disturbed, its productivity, ecological diversity, and stability. These parameters, in turn, indicate the relationship of a particular community to those around it and the role it plays in the total ecosystem. On this basis, the area's suitability for and susceptibility to serious disruption from various types of land use or development can be determined.

Several ecological consultants and planners have used this technique of partial ecosystem analysis based on vegetation surveys in environmental impact analyses and large-scale site plans. The following approach is summarized from the techniques suggested by Dr. Frank McCormick and Dr. David Adams, both trained ecologists who have served as land use planning consultants.[32]

1. Identify species associations and describe the distribution and abundance of major plant communities.
2. Relate species and community distribution to significant physical and biological, natural processes.
3. Attempt to assign relative importance values to species and communities based on their significance to major natural processes to be maintained.
4. Base land use decisions on these importance values to minimize:
    a. permanent changes in important biotic communities,
    b. farreaching effects that may influence other communities or ecosystems, and
    c. extreme physical alterations of the landscape that may have irreversible effects.

It must be emphasized that in this case the vegetation is being used to indicate the operation of the other components of the ecosystem. A complete ecosystem analysis would examine those other processes as well and attempt to make the relationships between them and the biotic communities more explicit.

A planner would have a difficult time justifying the protection of biotic communities themselves, however, except as they relate to characteristics of the land that society has decided, either by necessity or choice, should be maintained. It is natural processes which biotic communities reflect that are the real matters of concern. One of the primary advantages of an ecosystem approach to land use planning is the emphasis put on natural processes as characteristics of whole systems. These processes can be considered as services provided to human communities by natural ecosystems at no cost.[33] Such services as water and air purification, runoff control, soil formation and stabilization, climatic amelioration, and control of pest populations are performed by natural ecosystems in their normal operation.

Once the practical value of utilizing rather than destroying natural ecosystems functions has been accepted as a goal of planning, the next step is the development of methodology to achieve this goal. The following guiding principles to methodology development for ecosystem-based planning have been summarized from those proposed by the ecologist Dr. James E. Wuenscher in an ecologically based land use plan for the Eno River Valley in Orange and Durham Counties, North Carolina.[34]

1. Logical ecosystem units should be used as basic planning units to the greatest extent possible--watersheds for example. The significant point is that natural boundaries rather than purely arbitrary or political boundaries should be used.
2. Important natural processes should be identified as they occur in ecosystems of several sizes ranging from the whole region to individual small watersheds or other ecosystem units. Someone with ecological training should be able to identify at least the rough patterns of processes with a minimal amount of investigation based on aerial photographs, topographic maps, and field surveys. More detailed analyses are desirable in critical areas if time and money are available. For illustrative purposes, taking a river system as an example, the following processes might be identified: the use of water by vegetation; runoff regulation by vegetation and litter; aquifer recharge by soil percolation; aquifer discharge to maintain stream flow during dry periods; soil stabilization by vegetation to prevent stream siltation; filtration of urban runoff by vegetation. Various land use alternatives should be considered in relation to their impact on these processes in each small water shed and their cumulative impact on the entire river basin.
3. Specific land areas and biotic communities most important to the continued operation of these processes should be identified and located on the ground. These may then be examined in more detail with an eye toward their stability

in the face of land use related perturbations. In the river basin illustration above, the critical areas might include floodplains, riparian plant communities, vegetation and soils of steep slopes, aquifer recharge areas, and vegetated strips at the edges of roadways and other paved areas.

4. Environmental goals should be set for each ecosystem. Communities or planning departments at the local or regional levels must decide which of the natural functions they wish to take advantage of by protecting. One guiding principle should be maintenance of as many diverse species and habitats as is possible. Ecologists have found that the diversity of species and environments usually found in natural ecosystems has great value in maintaining system stability.[35] As human development encroaches upon naturally diverse ecosystems, the usual effect is to simplify them, thus decreasing their natural resistance to breakdown. Another guiding principle is to maintain as much undeveloped area in and around intensive development as is economically and politically feasible. The difference between the ecosystem approach and traditional open space reservation is that the aim of protection is not simply to keep land undeveloped, but to maintain the operation of natural processes that provide services to the human community.

5. Methods that will protect critical natural processes and will also achieve environmental goals must be developed and enforced.

While these guidelines may serve as a starting point, the ecosystem analysis approach to natural features inventory and land use planning is only in the early stages of development. Its emphasis on biological interrelationships, interdependencies of physical and biological systems, and a holistic view of the entire planning area make it a valuable approach that will no doubt be further developed and more widely applied in the future. Indeed, the understanding and analysis of ecosystem processes and the conscious aim of planners to protect them may be the only truly ecological approach to land use planning and the only possible way to plan for sustained environmental quality.

Visual Landscape Analysis

A third approach is visual landscape analysis. In contrast to the first two approaches which are based on scientific data about natural features and processes, this approach is based on visual observations by a professional, usually a landscape architect. The objective is identification, evaluation, protection, and enhancement of landscape features which contribute to the aesthetic quality of the environment. Although they concentrate mainly on visual beauty in landscapes, visual landscape analysis methods actually grow out of a concern for the total experience of the human observer. Visual beauty in the purest sense of harmony of form and color is only one element in this total experience which depends on the interplay of sensory, psychological, and sequential experiences. The sensory experiences are derived not from visual satisfaction alone but from an amalgam of all five senses including the sounds of birds, running water, rustling trees, and church bells and the smells of earth and vegetation. The psychological experiences are derived from a complex of emotions which can enhance or diminish the response to intrinsic landscape beauty, including sentiment, fear,curiosity, surprise, and veneration of age and history.[36]

K. D. Fines has developed a method of landscape evaluation in East Sussex County, England. The first step is establishment of a scale covering the total environment--townscape as well as landscape--calibrated on the responses of a representative sample of people to a series of photos of landscape types which range from unsightly to spectacular. Using this scale, matched to representative landscapes, a professional staff member surveys the planning jurisdiction to develop a landscape evaluation map.[37]

One of the better known pioneers in visual landscape analysis in this country is Philip H. Lewis.[38] Working mainly in midwestern states and counties and the Twin Cities metropolitan area, Lewis has contributed a method of identifying and evaluating patterns of perceptual quality within the landscape which stresses public awareness and identifies prime lands for recreation and conservation purposes. His techniques of identification and analysis are easily understandable and quickly applicable, particularly as a basic input for recreation-environmental planning.

Lewis has identified landscape resources on the basis of their contributions to visual contrast and diversity and divides them into those resources possessing intrinsic values (natural environments perceptually pleasing to man) and those having extrinsic values (qualities added to the environment by man, such as historic structures or waterfalls). The major intrinsic resources are inventoried first by a professional and include water, wetlands, flood plains, sandy soil adjacent to water, significant topography, views, major highways, and vegetation. A soil survey is added to help with later determination of suitable recreation uses. Local agencies and citizens are then recruited to add other intrinsic and extrinsic resources.

Once the intrinsic and extrinsic resources are located, they are mapped as points, lines, and areas on overlays. The resources tend to overlap in linear or lattice type patterns which Lewis calls environmental corridors and which follow streambeds, ridges, and steep slopes. More concentrated patterns of resources are then identified within the environmental corridors and priorities among them for acquisition or protection are determined.

R. Burton Litton, Jr. has developed a more purely visual analysis method for forest landscapes.[39] He has defined six variables which influence the way a landscape is seen by an observer. *Form* (for example, ridges, islands, mountains or hills); *spatial definition* (valleys or ravines which form outdoor rooms with floors and walls); and *light* apply to the landscape itself. For the observer, he identifies *distance from a landscape element*, *observer position* (above, below, or level with the viewed object), and *temporal and spatial sequence* within which a scene is viewed. He has also identified four types of landscape compositions--panoramic, feature (dominated by landmarks), enclosed, and focal landscapes which lead the eye to a focal point or edge.

A visual analysis may stand alone or be easily coordinated with the analysis of physical and biological features and processes to determine intrinsic suitability for land uses, particularly open space uses, recreation uses, and highways, within the total land use planning process.

General Remarks on Environmental System Inventory and Analysis

Three qualifying remarks must be added to this discussion of environmental system inventory analysis:

1. Despite the approach taken, the data used are markedly similar in all environmental system inventories. The primary distinction among the approaches is in the analysis, or data interpretation, stage and the geographic scale of inquiry. This is a function of (1) the bias, personal and/or professional, of those conducting the study and (2) the specific objectives of the study.
2. None of the examples cited have been evaluated for accuracy of data or appropriateness of data collection scale. In general, however, it appears that most inventories rely on the best data available regardless of scale or accuracy and attempt to "make do." This is, perhaps, a function of the urgency of information demands characteristic of the new environmental emphasis in planning.
3. Those researchers and planners most deeply into environmental data inventory and interpretation methods claim that the real cutting edge issues here are technical and focus on the quality of the predictive and evaluative models. Since data, models, and assumptions have not been evaluated here, some of the examples may not be at the cutting edge technically. Research is currently underway to develop better models.

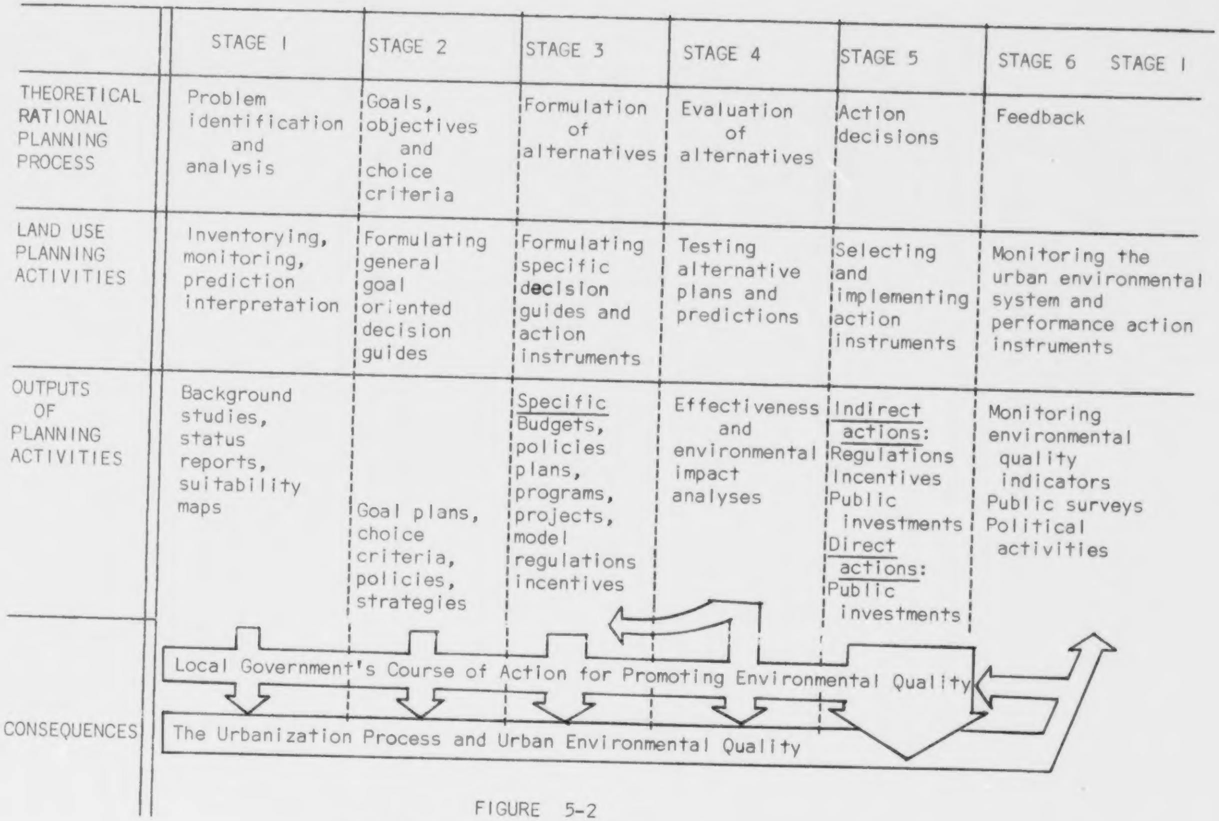
The Third Front: The Land Use Guidance System

The first two fronts of innovation which have been discussed--the redefinition of comprehensive goals to include an environmental objective and the inclusion of environmental system information in land use planning--simply set a new baseline from which to approach land use planning. Added to this is an increasing emphasis on carrying planning directly through to implementation. New goals, new information, and a new emphasis on implementation have spawned the development of new methodologies for incorporation in the land use planning process. In and of themselves, each methodology certainly warrants the designation, cutting edge. Together, they signal an even more dramatic potential for innovation in the total land use planning process. The potential synthesis of these methodologies points to a new land use planning process which we have termed guidance system planning. The ultimate aim of this planning process is the infusion of goals and information, which now reflect an environmental orientation, into the urbanization process.

The guidance system planning process, depicted in Figure 5-2 is an expansion of the concept outlined in Chapter I. It may be viewed on three levels: first, as a theoretical rational planning process; second as a series of planning activities; and finally as a set of planning outputs, or products, which influence the urbanization process. At any level, each stage evolves from and builds on prior stages. Guidance system planning represents an attempt to operationalize the rational planning process in which a problem is identified, goals are specified as objectives and evaluative criteria are formulated. Alternatives are then generated and evaluated, and finally, a choice among alternative actions is made and feedback is obtained over time. The process may also be viewed at a more operational level in terms of planning activity and output. The stages in the process at the operational level parallel the theoretical planning process stages. Once a broad goal of environmental quality is established, planning activity begins. Of course, previous planning activity may have pointed to the need to include environmental objectives.

Stage I: Problem Identification and Analysis

The first stage in the guidance system planning process involves definition of the problem. Before data collection and analysis begin, there should be a statement of major assumptions, a determination of the major environmental, urban development, and urban activity systems involved in the problem, as well as a preliminary model of the important variables to be inventoried and predicted and relationships to be analyzed. Inventories of natural systems in the area, existing land use, and many other factors are traditionally analyzed as informational input for land use planning. In addition, indicators of urban and environmental system performance may be monitored to explore current trends and predict future system performance. The output at this stage is primarily in the form of background studies and status reports which define key local problems



	STAGE 1	STAGE 2	STAGE 3	STAGE 4	STAGE 5	STAGE 6 STAGE 1
THEORETICAL RATIONAL PLANNING PROCESS	Problem identification and analysis	Goals, objectives and choice criteria	Formulation of alternatives	Evaluation of alternatives	Action decisions	Feedback
LAND USE PLANNING ACTIVITIES	Inventorying, monitoring, prediction interpretation	Formulating general goal oriented decision guides	Formulating specific decision guides and action instruments	Testing alternative plans and predictions	Selecting and implementing action instruments	Monitoring the urban environmental system and performance action instruments
OUTPUTS OF PLANNING ACTIVITIES	Background studies, status reports, suitability maps	Goal plans, choice criteria, policies, strategies	Specific Budgets, policies plans, programs, projects, model regulations incentives	Effectiveness and environmental impact analyses	Indirect actions: Regulations Incentives Public investments Direct actions: Public investments	Monitoring environmental quality indicators Public surveys Political activities
CONSEQUENCES	Local Government's Course of Action for Promoting Environmental Quality The Urbanization Process and Urban Environmental Quality					

FIGURE 5-2

LAND USE GUIDANCE SYSTEM PLANNING PROCESS related to environmental quality goals. Solutions to these problems become the objectives of the planning process.

Because there has been so much recent emphasis on developing a methodology for inventorying natural systems as an input to land use planning, new approaches to this component of the guidance system were given special attention in the previous section of this chapter. Regardless of which approach to inventorying environmental characteristics is taken, the output or information generated serves as the basic information system for planning. For example, in the preface to the Problem Recognition Study for Central New Hampshire Planning Region, the authors state:[40]

> This study is not intended to produce a master plan for the growth of the region... It is our intent to give to the Planning Commission a methodology for evaluating future development in terms of its effects on natural systems and the environment... It is also the intent of this study to apply the methodology to "recognize problems" and establish issues in the present development pattern of the region.

The term "problem recognition study" is an appropriate one for the output of this phase of the guidance system planning process. It facilitates the definition of the environmental goal into more specific objectives.

The information system for environmental systems produced through the inventory may be combined with a monitoring of urban growth or a prediction of potential growth patterns to highlight probable points of conflict between urban development demands and natural system demands.

The "Early Warning System" developed for the Santa Cruz Mountains area illustrates one approach to developing such a prediction capacity.[41] Essentially, the model is "a predictive tool for locating potential development/land dynamics conflicts."[42]

> The "Early Warning System" model illustrates a method of predicting those areas where there is likely to be a conflict between natural dynamic systems and five forms of development; selected residential, logging, tree farming, grazing and speciality crops... but the method is theoretically applicable to any land use. The system includes a comparison of a mapped expression of developer interests in terms of physical potential

> with a mapped expression of the natural dynamic systems of the same area... With the use of an Early Warning map the planner could easily identify the areas which are likely to have potential impact problems in advance of actual development. The nature of additional information which is required can be identified through an impact analysis process and land use policies can eventually be developed to avoid or at least minimize further environmental degradation.

The "Early Warning System" is an extension of environmental monitoring approaches found in air quality and water quality management. Environmental systems related to land are inventoried while urbanization trends are monitored and projected into the future to identify "hot spots" which should be given special planning attention.

A similar type of monitoring is under consideration in San Diego in conjunction with a comprehensive information system for planning.[43] However, "hot spots" are defined only as areas of increased urbanization and not in conjunction with an inventory of environmentally sensitive areas. It would be possible, however, to include environmental data in the information system so that an indication of the environmental sensitivity of an area to increased urbanization would be readily available.

Often, background studies and status reports generated during this first stage of the process include some general recommendations for dealing with major environmental problems. Problem identification and preliminary recommendations lead directly into the second stage of the guidance system planning process.

Stage 2: Formulation of Decision Guides

General decision guides are those plans and policies developed by planning staff to aid local governing bodies in their policy-making capacity. Such goal oriented decision guides create a framework of rules based on public goals in which more specific policies and decisions affecting land use will be made. As such, decision guide formulation is an attempt to pin down the decision-making process by making explicit the goals and objectives implicit in the myriad of day-to-day public decisions. The deliberate delineation of goals and criteria should reduce arbitrariness as well as establish criteria for evaluating implications of seemingly discrete public decisions based on a more comprehensive view of the urban system.

Traditionally, the land use plan and the comprehensive plan has served as such a decision guide. The land use plan is a generalized vision in map form of the desired future physical characteristics of the urban area in terms of location, intensity, and amount of land which will be developed for various space-using activities. In this sense, the plan has been viewed by decisionmakers as a synthesis of information on the optimal physical development pattern for the community. It may or may not be formally adopted. Theoretically, the pattern of urban growth depicted by the plan is to be reinforced by subsequent and more specific policies, regulations, incentives, and public investments. Insofar as the land use plan presents a visual interpretation of physical characteristics for twenty years hence, it has not always been the most effective context of information and objectives for evaluating the implications of day-to-day decisions affecting land use. Thus, the land use plan is often supplemented by policy recommendations as well as more detailed policy and program plans focusing on more specific issues within a shorter time horizon than the ten-to-twenty-year reference of the traditional land use plan.

The land use plan itself may include a set of policy recommendations focusing on one or more specific environmental problems in the area. Guilford County, N.C., for instance, addressed two critical problems in its land use plan which involved the impact of urban growth on the environment:[44]

> 1. Insuring an adequate supply of raw water in a county where the stream system consists exclusively of headwaters and keeping this supply pure at a time when unsewered development is beginning to spread across reservoir drainage basins.
>
> 2. When the drainage areas of existing sewage treatment plants in the two cities are largely developed (as they will be by the 1980's), it will be necessary to look for new drainage basins to sewer. The scale of projected population growth precludes any reliance on septic tanks.

This problem focus stemmed from an analysis of land capability (climate, surface water, water resource quality, the stream pollution problem, major surface water reservoirs, and soils) which was compared with population and economic growth projections. The strategy proposed to accomodate projected growth yet minimize its impact was for the county to "adopt a policy of promoting a small series of satellite communities." The new community locations were assigned to areas where the impact of the development on water quality could be minimized. It was recommended that growth be encouraged at these sites through the early provision of water and sewer facilities. (It should be noted, however, that subsequent action regarding this public utility provision has not followed this policy recommendation and growth is not being channeled solely to these areas.)[45]

The Optimum Land Use Plan for Redmond, Washington, is another example of a land use policy guide which emphasizes development based on congruence with natural land features.[46] Land capability was evaluated, in terms of surficial geology, current pollution levels (air, water, and noise), physiographic features (surface water, marshes, 100 year flood plain, acquifer recharge areas, slopes), climate and hydrology, vegetation and wildlife. Development principles appropriate to the conservation or improvement of each factor were recommended. For instance, with regard to identified flood plains, it was suggested that:[47]

> The 100 year flood plain should be designated as a floodplain control zone. Construction in this area should be allowed only on the edge of the floodplain where ponding alone occurs and should be limited to facilitate:
> minimum flood damage;
> minimal cost of storm drain improvements and expensive flood control structures;
> maintenance of acquifer recharge;
> maintenance of the high visual quality of the unique stream environment;
> preservation of stream quality for salmon and trout spawning; and
> preservation of limited agricultural land.

These natural land characteristics were then interpreted in terms of development constraints and potentials. Floodplains, steep slopes, and marsh areas were recommended for careful management. The suitability of land for gravel extraction, heavy building sites, homesites, recreation, agriculture, and conservation was examined. Further policy recommendations for each type of land use were presented.

Some areas were considered suitable for several different land uses. While two different land uses may not produce an adverse impact on land quality, they may, however, prove incompatible with each other. Prior to the design of the "optimum" land use plan, the compatibility of land use with land use (for example, camping with suburban residential development) and land use with land (commercial activity with slopes exceeding 30 percent) was assessed as being incompatible, moderately compatible, or fully compatible. In addition, each type of land use was rated as severe, moderate, or minimal in terms of its potential adverse environmental consequences. The resulting matrix of "land use inter-compatibility" served as a decision guide for designing a plan. Furthermore, a policy to "optimize multiple compatible uses, as well as single uses" was posed as a decision guide. Other inputs to design included evaluations of the economic base, projected land absorption, population growth, housing needs, development pressures (including parcel size and distribution and the prevalence of land speculation), and existing and projected land use distribution. Given these evaluations, it was concluded that[48]

> The land use allocation in the Land Use Plan can accomodate all the land uses dictated by market demand. This allocation also strives to conserve the most important natural features of the Planning Area. It can therefore be called the Optimum Land Use Plan.

Bucks County, Pennsylvania, has followed a more policy oriented, less map oriented approach to land use planning.[49] While individual municipalities in the county produce detailed land use plans in map form which serve as guides to public and private development, the county planning agency has focused on one critical problem--development at the urban fringe. Bucks County has proposed that a development sector concept be superimposed on individual town plans. Local zoning would prevail as long as it did not conflict with broader sector designations. The county would be divided into four classifications: "Urban areas where few parcels remain undeveloped; Development areas where growth pressures are intense; Rural Holding areas where much land is still in agricultural or forest, and development pressures are not intense; and Resource Protection areas where development would jeopardize natural, recreational and historic resources. Included are flood plains, precipitous slopes, and areas of outstanding historic or scenic interest."[50] The fundamental aim of the development sector policy is to "prevent scattered development and urban sprawl without discouraging development in general." It is recommended that growth be encouraged in designated development areas through provision of full public services and utilities planned for five-year periods. Simultaneously, growth would be discouraged in rural holding areas through regulation and withholding of public services and prohibited in resource protection areas. The sector designations would be reviewed annually and Rural Holding designations revised depending on market demand. Implementation of the strategy would involve the use of an official map for reservation, rezoning of land, and public investments, all of which necessitate cooperation among individual governmental agencies responsible for planning and capital budgeting at that level. At this point in time, two of the fifty-four individual municipalities in Bucks County and two regional planning groups covering ten additional municipalities are revising comprehensive plans using the development district as a basis.

A policy plan may focus on a more limited facet of the land use-environmental quality interface. For example, the Southeastern Wisconsin Regional Planning Commission has developed a Soils Development Guide.[51] The Guide was prepared for distribution to local jurisdictions within the seven county region to achieve three purposes:[52]

> First, to provide an understanding of the detailed soil survey and its accompanying interpretive analysis; second, to illustrate how such a survey and its

> interpretative analysis can be used in local, as well as regional planning and development; and third, to present suggested land use regulations that may be enacted by local units of government and that utilize and incorporate such survey and interpretations to better adjust both rural and urban development to the ability of the natural resource base to sustain such development.

The "problem" assessed in a policy plan need not be related to a specific resource, however, such as soils. The Atlanta Regional Commission recently completed a policy plan for an areawide resource, the Chattahoochee River Corridor.[53] The plan examines the use of a forty-eight mile stretch of the river north of Atlanta and the adjacent land 2,000 feet from each bank. The report recommends a comprehensive land development plan for the adjacent areas, development guides, and a program for public acquisition of certain areas vital to public recreation or the ecological health of the corridor. Some of the development guides are posed for countywide adoption--soil erosion, sediment control and flood plain development regulations while others are posed for adoption only within the 4,000 foot corridor--general development standards, a "River Buffer Zone," Flood Hazard Zone, PUD standards; and a voluntary protection zone.

The environmental "problem" addressed may be a potential economic environmental resource which is not regarded as a constraint to urbanization. The New York State Office of Planning Coordination prepared Long Island Sand and Gravel Mining,[54] a report, written for both local planners and the state itself, which views sand and gravel mining as the first step in a carefully thought out plan for reusing the land for desirable purposes rather than as an unavoidable blight on the environment.[55] Accordingly, recommendations are presented for determining general areas suitable for mining, selecting suitable sites, designing the site, and developing administrative and legal controls. Model standards for sand and gravel mining regulations are included.

All the land use policy plans and the more specific policy and program plans here serve as preliminary solution proposals to the key problems identified at the local level. Several steps remain before these recommendations are implemented. While, in the past, some planners may have argued that general recommendations were essentially the end point of the formal planning process, the increasing emphasis on implementation calls for the extension of planning into the realm of more discrete day-to-day decision-making, particularly for local planning agencies.

Stage 3: Generation of Specific Policy and Action Instruments

The third stage in the process is generation of specific policy or project proposals. For example, in the Optimum Land Use Plan for Redmond, Washington, cited above, it was recommended that the city acquire open space through less than fee simple purchase. If Redmond is to acquire open space in this manner, it must first determine which of the several approaches to less than fee simple purchase is most appropriate to its objective of open space preservation. Each of the alternative purchase arrangements must be examined in some detail. In the same plan, it was also recommended that floodplains, steep slopes, and marsh areas be carefully managed. Alternative approaches to such management remain to be proposed.

The Huntington, New York, Environmental Planning Program; also discussed previously, is example of a stricter policy plan approach.[56] No future land use plan in map form is presented. Rather, specific management actions, evolving from an inventory of the natural systems, are recommended and would apply generally throughout the area (for example, the prohibition of nitrogen-carrying fertilizers). In addition, certain parts of town are singled out for one of three alternative strategies: remedial action (for example, installing tertiary sewage treatment for existing development where cesspools and septic tanks exceed one per acre); redevelopment of urban infrastructure to restore ecological equilibrium (redesigning the storm drainage system into the local harbor); and protection of natural resources (public acquisition of remaining open spaces.)

Formulation of specific alternative action instruments is also a part of this stage in the guidance system planning process. In fact, the fundamental credo of guidance system planning--carrying planning activity through implementation--requires that planning inquiry from problem analysis through evaluation emphasize action instrument alternatives as much as decision guides because action instruments are what implementation is all about. Although discussion of action alternatives is delayed here until Stage 5, that is purely for organizational convenience. Ideally, they are also a critical part of this stage in the recommended guidance system planning process.

The more detailed implementation alternatives, either specific decision guides or action instruments, are rarely formally published by a planning agency. Quite often, these are generated and discussed internally among planning staff and a single proposal is then recommended to the decision-making body. In the ideal guidance systems planning process, however, these alternative actions would be discussed openly with decision-makers, and the evaluation criteria on which a final decision was based would be made explicit.

Stage 4: Testing Alternatives

The fourth stage is testing alternatives. The alternative action may be a specific plan, policy, program, budget, regulation, incentive, or public investment project. Evaluation of alternatives necessitates formulation of models: a model of the operation of the alternative under consideration interacting with a model of the urban system to be affected, and, if environmental impact is to be assessed, a model of the environmental systems affected.

Choices among alternatives depend on a number of factors and a decision must be made as which factors are most important. Explicit delineation of evaluation criteria, including the priority given to each factor, is necessary if decisionmakers (and planners) are to make choices among alternatives with full understanding of the implications. Such delineation involves making explicit not only the priority given each factor of evaluation but also the model of the urban process or environmental processes to be affected and the assumptions on which the model is based. This is not to suggest that models of the urbanization process or natural processes must be free of assumptions. Obviously, incomplete understanding of these processes necessitates reliance on expert judgment and therefore on expert assumptions. Nevertheless, when assumptions are made, they should be made explicit.

Theoretically, alternatives are tested for one purpose--attainment of objectives. In practice, however, the assessment of environmental impact is often separated from testing the effectiveness of the plan, policy, program, public investment, or regulation in attaining its primary objectives, which may not be environmental. The discussion will reflect this practical distinction between evaluation of effectiveness and evaluation of environmental impact.

Evaluating Effectiveness The Bucks County, Pennsylvania, Planning Commission has initiated a planning process which involves each of the planning process stages outlined thus far including the evaluation of effectiveness. The "Computerized Guidance System" developed by Bucks County represents a major revision in their planning process characterized by a "shift in emphasis away from maps toward issues and policy as the key elements of the plan, an automation of plan generation and testing, and greater flexibility."[57] In this approach, a variety of land use and natural inventory data is collected, organized on a 22.95 acre, 1000 x 1000 foot square grid basis, and placed in a computer file. Hence, the system includes an information system, Stage 1 of the guidance system planning process; Figure 5-3 lists the data comprising the information system. Various development policies (Stage 2 of guidance systems planning process) are then translated into model form in order to "relate the effect of a set of policies on a plan...to assist the County commissioners in establishing and following policies to achieve the desired end."[58] For example, series of policies were combined to produce a County Park Plan using this system of data and modeling links. Seven major policy areas were defined in relation to open space objectives: maximum utility; site quality; accessibility; proximity, land value; supply and demand; and threat. In terms of maximum utility, the operating policy was that "the park site which is suitable for the greater number of recreation activities is a better site than one suitable for fewer activities." Each policy was then converted into a model:[60]

DATA TITLE	NUMBER DISCRETE TYPES	DESCRIPTION
Cell number	17,862	1000 x 1000 foot cells
Watershed number	921	Major, minor, and subwatersheds; subwatersheds average 250 acres
Lakes	139	Code number and area
Ponds	-	Number per cell
Streams	-	Classification, flow character pollution index, area
Marshes	-	Area*
Cell elevation	-	Elevation at centroid of cell
Forest	-	Area*
Orchards	-	Area*
Geologic strata	26	Geologic classification (two digits) area (one digit) (three possible per cell.)
Subdivision		Area*
Zoning	9	Area*, 6 residential, commercial, industrial institutional
Highways	6	Freeway, expressway, parkway, arterial, collector, local
Transportation	14	Bus, air, water, facility description
Rail	6	Track type and terminal descriptions
Electric	8	Facility description
Pipelines	3	" "
Water	9	" "
Sewer	7	" "
Scenic areas	86	Hills, valleys, ridges, stream corridors
Scenic and historic sites	205	Code number, precise identification by municipality
Faults	8	Description of type
Solid waste	5	Description of type
Cliffs	3	Height of cliff
Soils	221	Soil code (3 digits), slope (1 digit) area* (1 digit) 9 possible types
Land use	9	Area*
Land value	-	Thousands of dollars/acre
Population	-	Population per cell
Dwelling units	-	Dwelling units per cell
Parcel size	-	Area* by size class
Employment	-	Employees working in all
Developed land	-	Area*
Undevelopable land	-	Area*
Municipality number	54	Municipality name
Planning area	640	In combination with municipality number

FIGURE 5-3

DATA IN BUCKS COUNTY COMPUTERIZED GUIDANCE SYSTEM
(* all area measurements are by 9ths of a cell)

> Some of these models are sets of overlays, whereby a variety of factors are combined to determine suitability for parks. The Site Quality Map is illustrative of this type model. The accessibility model is a behavioral model, based on a formula derived from a survey of county residents. Its basis is the observed effect of distance on frequency of park visitation. The urbanization threat model is a simulation model. Variables were: population growth by municipality, vacant land by municipality, presence of sewers, proximity to highways, and existing urbanization. No attempt was made to base this model on observed data.

The models for each objective were given a priority weighting and the combined model then applied through use of a computer to obtain an evaluation score for each cell. The outcome was a priority listing of acquisition sites.

The approach is also being used to develop a Natural Resources Plan for Bucks County.[61] The entire plan will consist not only of a land use intensity plan based on a comparison of each planning cell's natural features and its sensitivity to development, but also a set of implementation policies and the integration of the Natural Resources Plan with other elements of the comprehensive plan. The Natural Resources Plan, still in the first stages, involves three major steps:[62]

> The first step ... is to establish operational definitions for the various natural critical features of Bucks County.... Evaluation and weighting of critical natural features is the next step in plan development. Priorities for protection are established. ....The last phase in plan development is the setting of priorities and targets. Major policy issues are tested. For example, one policy might be to protect the most threatened resources. A conflicting policy would be to protect areas where land values are low and the most land could be preserved for each dollar spent. Both are valid planning concepts. A weighting system can incorporate the two into a single plan which may be pre-tested by computer, whereas intuitive discussions of conflicting policy issues often lead nowhere.

This type of policy analysis and planning feedback provides a good example of an attempt to make explicit the decision rules of planning. Such strict definition of objectives is often difficult to obtain from legislative decision-makers however. As one of the planners in Bucks County has stated,"There remains a reluctance to work as closely with the decision-makers, as the guidance system requires. This represents a hurdle that has not yet been completely resolved and which can have serious effects on the effectiveness of the system."[63]

Evaluating Environmental Impact In addition to testing the potential effectiveness of a plan, policy, or regulation, there is now a trend toward testing the environmental impact of alternatives. This may be especially significant when the alternatives generated were not specifically related to environmental quality objectives, for instance, alternative highway routings. Just how an evaluation of alternatives in terms of environmental impact can or should be made is currently the subject of much investigation among planners and environmentalists. This investigation has been spurred by the requirements of the National Environmental Policy Act of 1969, Section 102 (C) requiring that all agencies of the federal government:

> (c) include in every recommendation or report on proposals for legislation and other Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on--
> (i) the environmental impact of the proposed action,
> (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented
> (iii) alternatives to the proposed action,
> (iv) the relationship between short-term uses of man's environment and the maintenance and enhancement of long term productivity, and
> (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented[64]

In keeping with this requirement, all federal agencies now require an analysis of the environmental impact of any plan, program, or project sponsored by federal monies. For example, the Department of Housing and Urban Development's Comprehensive Planning Assistance Requirements and Guidelines for a Grant (the 701 Program) now include a requirement for "environmental assessment:"[65]

> Each applicant shall prepare an environmental assessment when the assisted work program will result in development plans or policies for land use, major community facilities, major utility systems, major transportation systems or the protection of natural areas (estuaries, coastal zones, etc.) The assessment, which shall not be written as a justification for any proposed project, program, task, or policy, must
>
> a. Include the following:
>   (1) A summary or abstract of the proposed plan(s) or policies;
>   (2) The environmental impact (beneficial as well as adverse) of the proposed plan(s) or policies, if they are carried out;
>   (3) Any adverse environmental effects which cannot be avoided should the proposed plan(s) or policies be implemented;
>   (4) Alternatives to the proposed plan(s) or policies and an analysis of those alternatives;
>   (5) The relationship, under the proposed plan(s) or policies, between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity;
>   (6) Any irreversible and irretrievable commitments of resources which would be involved if the proposed plan(s) or policies should be implemented; and
>   (7) A statement setting forth applicable Federal, State and local environmental controls.
>
> b. Be appended to the resulting proposed plan and accompany the plan through all deliberations leading to approval and subsequent amendment; and
>
> c. Be available to the public on a timely basis, including availability before public hearings regarding the plan.

In some states and localities, environmental impact analysis is on project proposals. Thus far, however, no state or local requirement includes an impact analysis on long range, comprehensive plans. The federal requirements as well as most state and local requirements for environmental impact statements simply provide for disclosure of assessed impact. The methodologies which have been developed for such analysis, however, could be used to choose the alternative which will produce minimal negative environmental impact if that were the objective given highest priority.

Most evaluation methodologies developed are applicable at the project level and are not suited to evaluation of a general plan such as a land use plan. These methodologies focus on producing an information display matrix for the decisionmaker For example, Luna B. Leopold, *et*. *al*. developed a display matrix in which the proposed actions that are part of the project--land transformation and construction activities--are related to a range of possible environmental impacts--physical and chemical characteristics of land and water.[66] Wherever a relationship between the action and the environmental element exists, the intersection must be given a score (from one to ten, with ten the greatest) on two factors: first, in terms of the magnitude of the impact, and second, in terms of the importance of the impact, and hence of the importance of the environmental element or sub-system, to the total environment. Steinitz, Rogers, Inc. followed a similar approach in an environmental impact analysis of ten alternative highway corridor routings plus a "no build" option in Rhode Island.[67] Each alternative was compared with a list of objectives reflecting various environmental systems.

The information display matrix approach is useful because, although models of environmental subsystems have been developed in which the various elements of single subsystems have been weighted in terms of importance to the system function, there is not yet an accepted model available in which impacts can be summed across subsystems. To a certain extent, the relative importance varies depending on the objectives of the given community involved. For instance, in some parts of the country, such as Los Angeles, air quality is a significant problem and is also perceived by the public as very important not only in terms of health but also in terms of visual amenity. Therefore, when Los Angeles evaluates the potential environmental impact of a project, the air quality effects may be given more attention than others. Thus, the importance of the various environmental elements to the total environment is somewhat relative although interactions among elements and subsystems exist. Given this aspect of relativity, and the technical problems in comparing unlike impacts, methodologies for evaluating environmental impact currently focus on describing and listing the separate impacts, relationships, and interactions so that the decisionmaker can infuse his own perception of relative importance of each impact type into the final analysis.

Stage 5: Selection of Action Instruments

The fifth stage of the guidance system planning process involves making a decision or choice among the alternatives which have been evaluated. If the choice among alternatives is at the general level, this choice is fed back into Stage 3 for development of more specific plans, policies, programs, and projects. If the choice, however, is of specific policies, programs, or action instruments, the result is implementation of an action instrument. At any rate, the choice must eventually come to the action instrument stage if actual environment quality is to be affected.

Action instruments may be categorized as direct and indirect. Direct action instruments to achieve environmental quality goals are those public investments such as sewer systems, water supply systems, transportation systems, and the like, which impact directly on the environment. Indirect action instruments are those regulations and incentives which establish a framework of rules and conditions for public and private development, such as zoning, subdivision, and building codes and taxation policies. Some direct public investments, however, provide an important part of the framework or support system for urban development in the private realm, thus exerting an indirect effect by providing the conditions necessary for development.

Since much of planning is aimed at creating a framework of rules within which private development can occur in keeping with public objectives, the new objective of environmental quality has fostered a search for and development of new types of indirect action instruments--regulations and incentives. To a large extent, this search has been characterized by simply a new evaluation of rather traditional guidance instruments resulting in their modification, expansion, redirection, or more intensive application.

The following discussion of innovative action instruments is a brief summary of those guidance strategies exhibiting the most potential for effectively bringing the urban development process in line with environmental quality goals. The discussion focuses on the control of urban development and is centered around three fundamental objectives:

1. control of the spatial location of development;
2. control of the timing or sequence of development; and
3. control of spatial design characteristics at the site.

Action instruments appropriate for controlling where, when, and how urban development occurs are discussed. Since the control of the spatial location of development is intimately related to the control of the timing, or sequence, of development, techniques for achieving the first two objectives tend to overlap.

Control of the Spatial Location and Timing of Development

These two objectives are central to land use planning, and techniques for their effectuation have long been a dominant theme in planning literature.[68] Much of the early concern with techniques for controlling the location and timing of development was related to four "needs":[69]

1. Economizing the costs of providing municipal facilities and services and maintaining them at a high quality level.
2. Retaining municipal control over the eventual character of development by preventing premature and sporadic building in unripe places.
3. Maintaining a desirable degree of balance among various uses of land.
4. Achieving greater detail and specificity in development regulation.

These "needs" have remained valid over time, although their circumstantial basis has expanded to include: municipal fiscal balance; equitable housing opportunity for all socioeconomic groups; provision of adequate public facilities to insure public health, safety, and welfare; and, more recently, prevention of development where, and/or when, it would impact adversely on the environment.

Assuming that an environmentally sound land use plan has been developed for the area, there are three general categories of implementation tools to guide development into suitable locations--zoning, taxation policies, and major public investments such as transportation, water, and sanitary sewer systems. Obviously, there are traditional guidance tools; however, their application to the implementation of environmental quality objectives has elicited innovative variations on a traditional theme and a more strident attitude toward their application. A separate discussion of each category facilitates clarity but is, nevertheless, somewhat artificial. These action instruments, to be effective, must be designed to reinforce one another and operate in a synergistic manner to guide growth. The need for an effective strategy to coordinate regulations, taxation policies, and public investments elicited the development of a fourth type of action instrument--the development sector strategy.

Zoning Innovation in zoning has been characterized primarily by the creation of new types of zones or districts.

Large Lot Zoning This zoning technique involves designating areas, which are deemed valuable for their natural resources, agricultural potential, or simply as open space, for very low density (minimum one to five acres) single family or agricultural use. This approach is legitimately useful for areas which are difficult to service with public water and sewer, at least in the near future, and which would become environmentally degraded through high density development. Often this type of zoning is applied to stave off development until some future time when adequate public services may be provided; however, it has disadvantages if used for such a purpose. If development pressure is intense, rezoning may be granted even though more intense development would be premature. Gunnar C. Isberg, Director of the Dakota, Minnesota County Planning Department in the Twin Cities area, recently commented on his experience with the large lot zoning technique:[70]

> As was indicated previously, development in the rural areas usually begins with scattered, large-lot, single family homes along township and county roads. After a period of time, this type of development usually leads to increased demands for additional services (both in terms of quantity and quality). This places added pressure on the local communities to re-zone areas and allow additional development in order to build up the tax base. For example, the 1-5 acre minimum

> lot sizes in effect in many townships in Dakota County has not been very effective in discouraging development to date. Recently there have been proposals in several townships which have adopted a 2 1/2 acre minimum lot size. One is a proposed development for 100 lots and the other of 40 lots of 2 1/2 acres each, which is an incredible and inefficient use of land.

While large lot zoning may be environmentally sound in particularly fragile environments, it has the disadvantages of resulting in the inefficient use of land through scattered development and it is also under fire as a form of exclusionary zoning in the name of environmental protection.

Exclusive Agricultural Zoning The Village of Harristown, Illinois, Zoning Ordinance states that:[71]

> The Agricultural Zone is established as a zone in which agriculture and certain related uses are encouraged as the principle uses of land. The specific intent of the Agricultural Zone is to facilitate the long term use of lands best suited to agricultural production by preventing a mixture of urban and rural uses which often create incompatibilities and conflict with agricultural pursuits, which place unbalanced tax loads on agricultural lands and which may result in speculative or inflated land values which encourage the premature termination of agricultural pursuits.

Three comments on effective agricultural zoning should be made. First, as implied in the above definition of agricultural zoning, the tax assessment policy on such land is a crucial factor. Too often, development pressure in urban fringe areas brings a rise in the property tax on agricultural lands, agriculture becomes uneconomical, and the land is sold prematurely to development speculators regardless of the zoning. Several states have taken steps to deal with taxation of agricultural land. (Such tax policy as an urban guidance tool will be discussed as a separate topic.) Secondly, since exclusive agricultural zoning is intended to promote agricultural activity, it should be applied only to prime agricultural land if zoning is to be used in keeping with the best and highest use doctrine of public interest on which it is constitutionally based. Special agricultural soil suitability maps can provide the data necessary for delineation of such districts.[72] Thirdly, Isberg notes the potential difficulty in effecting agricultural zoning:[73]

> ...many farmers will resist such a zoning classification, unless reassured that their property will be re-zoned when they want to sell at speculative values. Thus, it is ironic that the very device designed to "save" agricultural land is likely to be resisted by many farmers.

A similar drawback was observed several years ago in Santa Clara County, California:[74]

> Agricultural zoning has been most widely used in California, where rapid urban growth is devouring fertile farm lands. Santa Clara County, just south of San Francisco, is one of the most important fruit producing regions in the world. The Santa Clara Valley had a 1957 income of $86,000,000 from nuts, wine, fruit, and vegetables; yet, with fifty new houses springing up daily and the 1950 population of 290,000 projected to rise to 2,100,000 in 1985, agricultural acreage is expected to decline sharply. To divert some of the population growth from agricultural land, Santa Clara County has zoned 100,000 acres for exclusive agricultural use. However, only the land of willing farmers is zoned for agriculture, and the land may be removed from this classification upon annexation to an incorporated area. This is the procedure often chosen by farmers wishing to free their land from agricultural zoning so as to sell it for development. Since 1954, approximately 83,000 acres of agricultural land have been annexed to cities.

Conservation Zones Borrowing again from the Harristown, Illinois, Zoning Ordinance:[75]

> The Conservation Zone is established to prevent the construction upon or alteration of rural or natural environments which have natural conditions of soil, slope, susceptability to flooding or erosion, geological condition, vegetation or an interreaction between the aforesaid, which makes such lands unsuitable for urban development. Further, this Zone is established to protect areas of the environment, that, if altered, would cause health, or pollution problems and environmental deterioration. The Conservation Zone will also insure adequate areas for future conservation and recreation pursuits. Certain agricultural uses would be permitted.

A conservation zone, like an agricultural zone, may be subject to rezoning to a more intensive use due to development pressures unless local government is strongly committed to a protection policy and reinforces it through appropriate tax assessment and public investment policies. Furthermore, such a protection policy should be region-wide and supported by all localities since "rezoning of conservation areas by one municipality can be detrimental to its neighbors."[76] Conservation districts, which are sometimes called Natural Resource Districts, are intended primarily for conservation use alone although agriculture is often permitted. For example, the Coon Rapids, Minnesota, City Code establishing a Conservation District cites the following permitted uses:[77]

(i) Outdoor recreational uses operated by a governmental agency or conservation group, homeowners or private association and facilities for making some useful to public or association.

(ii) Open space areas connected with residential, commercial, and industrial planned unit development.

(iii) Conservation uses including drainage control, forestry, wildlife sanctuaries and facilities for making some available and useful to public.

(iv) Agricultural uses.

(v) Nature study areas and arboretums.

Donald E. Reis, Community Development Director in Coon Rapids, writes that[78]

> This district is intended to include areas possessing important natural features (flood plains, steep slopes, wetlands), parks and areas preserved as common open space in PUD's.
>
> The CD District was adopted by the City in May of this year. Since that time, approximately 900 acres of the City's 14,400 acres have been rezoned to this classification. Of this amount, about 60 acres is privately held, the rest is in public ownership. We foresee that at least 1000 additional acres will be rezoned CD in the near future.
>
> Thus far, we have been receiving cooperation from most private landowners in the rezoning of their land to CD. This is because we defer assessments on such property with its rezoning. Additionally, we allow such areas

> to be used for density purposes within an overall development. Therefore, a developer can achieve the same density within a development no matter if he utilizes the natural area or not.
>
> Among the hurdles we have run into are the traditional types; such as, "You want me to pay taxes on the land yet won't allow me to use it." We have tried to overcome these arguments by allowing a Special Use Permit provision which would permit usage of a CD area under strict controls. If a developer wishes to use a CD area, he would have to formulate a site plan which would be compatible with and incorporate the natural features into the plan and would have to show that he would be substantially damaged if required to place the intended development outside the CD area.
>
> In designating areas intended for rezoning to the CD District, our first step is viewing the City's soil map prepared by the Soil Conservation Service. We then field inspect those areas indicated as having poor soils (peaty), high water tables and steep slopes. If an area is found to have a variety of plant life and provides significant wildlife habitat, it is given a high priority for rezoning. Other areas possessing limitations for construction are then ranked in order according to the field inspection of their vegetation and habitat. Areas given the highest priority are those areas found adjacent to the streams that flow through the City. We feel our first task in preserving natural areas is protecting our stream corridors and their adjoining bluffs.

The development of a Conservation District in zoning ordinances reflects recent concern with areas exhibiting high sensitivity to development because of a variety of factors interrelated as an ecosystem. Nevertheless, a number of more specific, yet still conservation oriented, zoning and other development ordinances have been developed: flood plain zoning;[79] coastal plain zoning;[80] wetlands zoning;[81] stream bank zoning;[82] shoreland zoning;[83] and steep-slope zoning (or hillside ordinances).[84] Often a special use permit is required for any construction in environmentally sensitive areas or for types of development with high impact potential. Special use permits allow for a greater degree of detail and flexibility in controlling the quality of development and its impact on the environment.

Impact Zoning innovatively dispenses with traditionally more rigidly restrictive (but capricious) zones designed for particular land uses. In place of traditional zoning practices, a government prescribes criteria for impermeable coverage of sites, services required by certain land uses to be within a given proximity, and compatiblity among land uses. The criteria aim to foster conservation of the natural envrionment and development of a desirable spatial pattern without being abritrary and inflexible.

John Rahenkamp and Walter S. Sachs of Rahenkamp Sachs Wells and Associates originated the impact zoning system.[85] They claim that their Development Impact Model serves as both a performance standard and a method of computation by which any development proposal can be measured for its potential impact on the natural, social, and economic environments.[86] It thereby serves a dual function as action instrument and decision guide.

The action instrument is the set of performance standards which all proposed projects must satisfy:

1. the impermeable cover on an area must not exceed a prescribed percentage of that area;
2. services which have previously been deemed essential to the proposed type of project must be available;
3. the proposed type of project must be compatible with adjacent land uses. (A government must have previously catalogued all possible land-use juxtapositions as compatible, incompatible, or varying shades of in-between.)

A government can measure any proposed project on any proposed site against its chosen performance standards. Data about the project can be plugged into a computer program which already contains a data bank for the whole planning area; the program solution will rate the proposed project as meeting or not meeting each of those standards. In borderline cases, a legislative body may wish to override the judgment produced by the program (for example, when the program solution reports that a project would be only mildly incompatible with adjoining land uses).

An impact development model can provide other information about the impact of a proposed project on a proposed site, for example construction costs of a project on various sites; revenue produced; and cost of services which a project will demand. This information can be a valuable decision guide for policymakers. It may help a government to know where to give or withhold incentives for construction and which projects to discourage until beneficial concessions have been made by the developer. Or it may provide cities, who are taking "fair-share" low-income housing, with a case for collection of a subsidy from higher government. Conceivably, a government might routinely subject any proposed development to a criterion of whether its long-run financial benefit will outweigh its long-run cost, rejecting the proposal if costs exceed benefits. A decision guide such as this "income generated must exceed services provided" criterion might easily become exclusionary to low-income residents, however, and this is a definite limitation to such an approach.

Taxation Innovations in taxation policy to control the timing and location of development have been closely related to attempts to establish and retain conservation and agricultural zones. For example, in Wisconsin, state law[87] requires that land be assessed at its full market value, that is, in accord with its development potential, a potential often over-estimated because of scattered development and the speculation in land values this fosters. The Southeastern Wisconsin Regional Planning Commission notes that:[88]

> Under present Wisconsin Constitution and Statutory Law, the most satisfactory way to relieve the owner of lands zoned for exclusive agricultural or conservancy use from unrealistically high property assessment and taxation is to remove the development potential. This may be accomplished in one of three ways:
>
> 1. The property owner may voluntarily grant an easement to a local unit prohibiting development for a period of at least 20 years.
> 2. The property owner may voluntarily place restrictive covenants upon the lands enforceable by a governmental unit in perpetuity or for some substantial period of time.

> 3. A governmental unit may purchase the development rights.
>
> All of the private or governmental actions will serve to permit the local assessor to assess open lands at their fair market value for agricultural and conservancy uses and not on their potential value for urban type uses.

Minnesota's "Green Acres Law"[89] authorizes owners of agricultural land to receive deferments on property taxes. Agricultural land is assessed according to its market value given that use until it is sold or converted to urban use. At that time, the owner must pay the difference between the taxes paid under an agricultural assessment and that of an urban use assessment plus interest for the previous three years. A further aspect of the act is that special local assessments on improvements are deferred until the property is converted to urban use. The Minnesota law requires no commitment by landowners to future agricultural use. California and Hawaii have similar assessment policies, although a commitment to agricultural use is required for a minimum of ten years. A recent study of preferential tax assessment on agricultural lands in New Jersey suggests that if such policies are not coupled with a required commitment to future agricultural use, they may simply encourage speculative purchase of farmlands.[90]

The Livingston County, New York, Planning Board is now utilizing the "Agricultural Districts" Law enacted by the State in 1971, designated "to encourage continuance of a strong agricultural industry in the state and to discourage urban scatteration into good farm areas."[91]

> Five major provisions would apply within any agricultural district:
>
> 1. Farmers may apply for an agricultural value assessment on their lands.
> 2. Local governments are limited in enacting ordinances that would restrict or regulate farm structures or farming practices.
> 3. State agencies must modify administrative regulations and procedures to encourage the maintenance of commercial agriculture.

4. The right of public agencies to acquire land (or to advance funds for non-farm development) may be restricted or subjected to delays, and the agencies will be required to consider alternative means.
5. The power of public service districts to tax farm land for sewer, water, lights and non-farm drainage will be restricted.

Pennsylvania's Act 515, passed in 1965, is based on the same concept of tax abatement or deferral. Act 515, however, differs from some other state laws in that it is applicable to natural resource areas other than simply agricultural ones. Act 515 "enables certain counties of the Commonwealth to covenant with land owners for the preservation of land in farm, forest, water supply or open space uses."[92] The provision is currently used by Bucks County as an implementation strategy for the Comprehensive Plan.[93]

> The following shall be eligible to be covenanted under the provisions of Act 515 if not otherwise excluded under Article III of this plan.
>
> 1. Farm Land. Any tract or tracts of land in common ownership of at least 50 acres in area used for the raising of livestock or for the growing of crops.
> 2. Forest Land. Any tract or tracts of land in common ownership of at least 25 acres in area used for the growing of timber crops.
> 3. Water Supply Land. Any contiguous land area of ten acres or more, described as having naturally formed slopes greater than 20% or subject to flooding at an average frequency of once every 50 years or the highest flood of record, whichever is greater.
> 4. Open Space Land. All lands in Bucks County held in common ownership which have 3% or less site coverage (including structures, roads, and paved areas) except those lands ineligible under the provisions of Article III of this plan.

Land occupied by manufacturing, transportation, communication and utilities, trade, service, cultural, entertainment, recreation, resource production, and extraction uses is ineligible. The covenant under Act 515, as amended in 1972, involves a twofold commitment for ten years: (1) by a landowner to maintain his land as open space; and (2) by the county to assess the property at fair market value given the restrictive covenant. The covenant is automatically renewed each year and the ten-year period is extended by one year unless either the landowner or the county decides to terminate it. The county may terminate the covenant on the sole ground that the designation of the land parcel is no longer in keeping with the adopted municipal, county, or regional plan. Experience with Act 515 in Bucks County has been somewhat limited, although 2000 landowners have applied to utilize the act. Landowners, even speculators, may sign a covenant; the 5 percent fine on back taxes for a five-year period makes this act only a holding measure--it does not permanently protect, but does buy time.[94]

Public Investment Innovations in the area of public investment to control the location and timing of urban development have been characterized by an increased recognition and use of public utility and transportation systems to shape urban growth patterns. A recent survey of twenty-nine planning directors in ten states stretching from North Carolina to Wisconsin conducted by the Water Resources Research Center at the University of Tennessee reports that 96 percent of the respondents evaluated the location of major highways and improvements as a successful implementation device; 58 percent reported that the location of trunk water lines was an effective control strategy; and 70 percent found the location of trunk sewer lines a successful strategy.[95] The report cautions, however, that "while various plan implementation techniques are generally given high scores, the planning function in urban government is widely recognized as generally not having been very successful in implementation of land use plans except where those plans have merely extrapolated present trends."[96] The analysis of the survey findings further states that:[97]

> Since water and sewer extension policy cannot be used to implement a plan if no plan exists, the first question asked 'Does your planning agency have an explicitly stated policy and/or published plan concerning the desired location of new urbanization?' Eighty-one percent responded affirmatively. Thus, in approximately one out of five cases the use of water and sewer extension policy to accomplish a desired pattern of urban growth is not a viable possibility.
>
> The next question asked 'If yes, does the policy and/or plan indicate a desired sequence of development?' That only twenty-nine percent of the respondent jurisdictions had policies and/or plans specifying both the desired location and desired sequence of new urbanization would seem to be as important to the economical provision of public facilities and services to serve new residents as would the location of that growth. However, only a minority of urban land use plans incorporates staged development plans. It is to be expected as planners become oriented to plan implementation, temporal dimensions or plans will become much more important.

As the survey indicates, most urban areas do have some type of locational development policy. For example, the Metropolitan Council of the Twin Cities, Minnesota, has adopted a "Diversified Centers" growth strategy.[98] That portion of the Metropolitan Development Guide dealing with sanitary sewers states the following policy with respect to their use as a device to implement the growth strategy:[99]

> -Phase interceptor extensions to promote orderly and economic development.
>
> -Extend interceptors into communities only when the residents are assured of governmental capability to provide a full range of urban services and to exercise adequate planning and control.
>
> -Prohibit extension of sewer systems into areas where development should not occur, such as flood plains, airport clear zones, major groundwater recharge areas, and areas designated for open space use.

Similarly, the *Development Guide* indicates that open space, transit, and thoroughfares will also be used as means to implement the development plan.[100] Isberg notes that it may be too early to evaluate the success of these policies yet he again offers some important insights into the types of problems which the Metropolitan Council has encountered in attempting to effect these policies.[101]

> For one, the Council has not firmly determined which areas in the metropolitan area should be encouraged to develop and which areas should be "saved" for agricultural production or simply left in an existing open space... As a consequence, the Council has been reluctant to turn down sanitary sewer extension requests by many of the suburbs.
>
> Secondly, the Metropolitan area is currently planning a "catch-up" game in relation to expansion of the major public utilities, especially sanitary sewer facilities. That is, most of the facilities being planned for and constructed at the present time are to serve a need developed by past and existing ongoing development. Until such time that the metropolitan area has reached the position of serving all existing needs, it will be very difficult to use utility extension policies to purposely "shape" development with any great degree of effectiveness.
>
> Third, there still is basically a lack of agreement and coordination between different agencies responsible for the provision of sanitary sewers. At the present time, there are a host of agencies involved in the planning, construction and financing of these facilities,... it is no secret that the aims and policies of many of these agencies conflict.
>
> Fourth, the Metropolitan Council does not have adequate control over the use and construction of private sanitary sewer systems such as septic tanks and drainfields. Unless control can be exercised over private sanitary sewer systems in the urban-rural fringe, it will be difficult to use sanitary sewer policies to control development.
>
> Fifth, the Metropolitan Council has not achieved complete coordination in the policies and programs for the different functional areas such as highways and sanitary sewers. ...A major sanitary sewer plant and interceptor is currently being constructed for the north-central portion of the county which will "open up" development in this area, yet the

> proposed transportation plan .... indicates that major highways will not be constructed in this area until sometime in the distant future.
>
> Finally, "political factors" have complicated the use of utility extension policies. That is, land speculators, developers and officials of many local communities have put a great deal of pressure on representatives of the various public agencies, especially the Metropolitan Council, to approve extension of sanitary sewer systems.

It appears, therefore, that in order for public investments to serve as an effective implementation device for a land use development plan, such a plan must be stipulated in some detail, both with respect to location and timing of development. Various financing techniques, such as differential user charges,[102] for utilities may also be effective.

Coordination of Several Action Instruments

It may be generally stated that no single tool is effective in and of itself. The essence of guidance system planning is the design of a coordinated series of action instruments which, operating in concert, create a new set of conditions and rules for urban development. The development sector strategy is one approach to coordinating regulations such as zoning, tax policies, and especially public investments. Two basic approaches to achieving an interface between public investment planning and land use planning have been offered. The first, termed Framework or Development District Zoning, is more a technique for utilizing comprehensive capital improvement planning to control the location and timing of development than a traditional zoning technique emphasizing segregation of incompatible uses. For example, Bucks County, Pennsylvania, as described previously, has proposed the use of a development district concept.[103] Four types of development areas are proposed: urban, development, rural holding, and resource protection.[104]

> The fundamental policy is to prevent scattered development and urban sprawl without discouraging development in general. This policy is based on the assumption that it is advantageous to fully

> develop certain clearly defined areas within a short time. These development areas would provide full public services and utilities planned for a five-year period. The plan is reviewed annually and the area increased with rational extensions of sewer lines, highways, and public utilities, based on changing trends.
>
> As construction is encouraged in development areas, it should be discouraged in rural holding areas until development there becomes desirable and feasible. The rate at which services are extended, and the size and location of the area into which they are extended, should depend largely on market demand.

Growth is encouraged in development districts not only through the provision of public services based on a five-year program but also through rezoning parcels to more intensive uses. Only in development areas is more intensive use zoning applied. Rural holding districts are placed in a "wait-and-see" condition and would be reevaluated periodically.

Development in holding districts would be discouraged through several measures. Public services would not be extended for five years at least. Other effectuation measures would include large lot zoning (minimum 5 acres), lower tax assessments under Act 515 (previously discussed), prohibition of development on sites exhibiting unfavorable percolation, agricultural management and assistance programs for farmers, and public education.

Development would be discouraged or prohibited in resource protectior areas through resource protection zoning of critical areas, reservation by official map of protection areas to be acquired within three to five years, and purchase of development rights or easements. Thus, although capital improvement planning is fundamental to the development district concept, a number of other guidance techniques are coordinated to effect the plan.

An additional dimension may be added to the development sector strategy through use of a development timing ordinance, the second basic approach to coordinating public investment to control the location and timing of development. Although this type of ordinance is not entirely new,[105] its recent revival by the town of Ramapo, New York, has created a great deal of interest.[106] In 1969, Ramapo[107]

> amended its zoning ordinance to create a new kind of "special permit" use labeled the "Residential Development Use." Anyone wanting to use land for residential development cannot do so without a special permit. And a special permit is granted only if standards are met for minimum facilities and services available to the new development. The required services include sewerage, drainage, parks or recreation, schools, roads, and firehouses. The ordinance sets up a point system of values assigned to these services. A special permit requires a proposed development to satisfy at least 15 development points. The town, for its part, is pursuing an overall development plan and a capital improvement program drawn from that plan. If services needed for residential development are missing, Ramapo proposes to include them within its 18-year program of capital improvements, of which the first six years are specified in a capital budget.

Although Ramapo amended its zoning code in this manner because its rate of development was far greater than its financial and physical abilities to provide necessary public facilities and utilities, this type of special use permit could be used to funnel growth to areas ecologically tolerant to development. It should be noted that the Ramapo approach is still being tested in the courts, although New York State's highest court has upheld it.

Regulations such as zoning, tax policies, and public investments serve to channel development into desired locations only in a very general sense. The coordinated provision of public services according to a scheme outlined in a general land use plan, whether or not the plan is supported by development district zoning and/or a development timing ordinance as in Ramapo, may direct growth to general areas. This may halt urban sprawl and the flagrantly inefficient use of land resources and channel growth away from large areas not yet impacted by urbanization; however, even within designated growth areas, development must be steered away from critical areas (for example, hillsides and stream banks) and controlled to reduce the potential for degradation which urbanization carries with it in any location.

Control of Spatial Design Characteristics at the Site

Basically, there are three ways to protect the environment by controlling the spatial design characteristics of development: use of density zoning or planned unit development ordinances; inclusion of critical environmental provisions in zoning, subdivision, building, or health ordinances; and requirement of environmental impact analysis on proposed development as a prerequisite to granting rezoning, subdivision plats, or building permits.

The planning literature has offered a rather extensive discussion of the relative advantages and disadvantages of density zoning and planned unit development.[108] Essentially, both density zoning and planned unit development offer the developer flexibility in designing the site as long as an overall density restriction and other requirements for improvements are met. This flexibility offers the potential for promoting environmental quality, since development may be clustered and sensitive areas retained as open space. Most density zoning or planned unit development ordinances require submission of a site plan as a prerequisite to approval. Through site review, assurance can be made that optimum site design and construction practices, from an ecological perspective, have been achieved. Since public funds to acquire open space and regulatory measures to protect all critical areas are limited, density zoning and PUD ordinances provide another potential method of control. For example, not only might a developer be given flexibility in the design pattern if some open area is maintained, but he may also be given a bonus in increased density allowance if the site plan adequately protects some key natural feature from degradation. There has been some discussion of density zoning and PUD's as means to limit the amount of paved surface necessary in development, thus reducing runoff. This is based on the assumption that clustered development will not require as extensive a road system as a traditional subdivision. Bucks County has proposed an innovative addition to standards for cluster developments--not only would density requirements be stipulated but so, too, would an open space ratio and an impervious surface ratio (a ratio of all surface area impervious to rain, such as buildings, parking areas, driveways, roads, sidewalks to the gross site area).[109]

An expansion of this idea is the concept of Environmental Characteristics Planning, developed by Jacob Kaminsky of the Baltimore Regional Planning Council. ECP suggests a kind of "environmental PUD"--a prescription of development types of different environmental characteristics and their allocation to appropriate districts in the planning area.

> Within each type any physical layout proposed for development would be allowed if it is in character with the development type. Innovative combinations, arrangements, and interrelationships of structures and uses would be permissible. Diversified development would be allowed in each development type as long as the character of the proposed development is faithful to the character envisioned.[110]

Development types would be delineated using the same instruments proposed in Bucks County--an open space ratio and an impervious surface ratio (called a natural-to-manmade-surfaces ratio by ECP)--and others, including a floor area ratio and a parking space ratio. Other less common instruments suggested by Kaminsky are a density ratio (the maximum number of people in residence, or the number of employees in a place of work allowed per square foot of floor area); a landscaped space ratio (a minimum square footage of nonvehicular outdoor space required for each square foot of floor area); and a height-distance relationship (the relationship between the height of a building and its distance from other buildings).

For each instrument, varying standards are set to define individual development districts. A prospective development must meet the standards of a given development district before any building occurs. This implies that ECP should be incorporated into zoning regulations and that a development district map should supplement the zoning ordinance.[111]

A second means to control spatial design characteristics is inclusion of critical environmental provisions in zoning, subdivision, building, or health (for example, septic tank) ordinances. The Buffalo County, Wisconsin, Zoning Ordinance includes wet soils, steep soils, and suitable soils districts as overlays to all general zoning districts. These districts carry supplemental controls over land use in addition to the regulations of the respective primary zoning districts.[112] For instance, wet soils overlay districts exhibit periodic high water tables, therefore, any use permitted by the primary zoning district is allowed which does not require basement or subsoil disposal. Similar special soil regulations for incorporation in local zoning ordinances are suggested by the Southeast Wisconsin Regional Planning Commission's Soils Development Guide.[113] The Guide also offers model soil regulations (appropriate for southeast Wisconsin) to be included in subdivision ordinances, building ordinances, and sanitary, health, or plumbing ordinances. The primary purpose of such provisions is to control pollution of sub-surface groundwater. These provisions, along with construction ordinances, may also limit erosion and siltation by prohibiting development on particularly erodable soils.[114]

The third approach to site control is to require developers to submit an environmental impact evaluation on proposed development. Although such requirements are limited to disclosure requirements only, they tend to shift the ultimate responsibility for environmentally sound development practices to the developer. Furthermore, such public disclosure provides a "pressure point" for public officials to suggest necessary remedial action to be taken by the developer. Huntington, New York, for example, now requires impact statements for any subdivision of more than five lots and all industrial sites plans. The Department of Environmental Protection in Huntington also reviews all rezoning and variance requests with respect to environmental impact; however, their "word is far from final and the review authority is informal."[115]

The Rocky Mountain Center on Environment has proposed a Model Environmental Subdivision Regulation which would extend the impact statement requirement concept beyond disclosure. No subdivision permit would be granted unless the "Environmental Inventory and Analysis" was adequate and insured that the development essentially would not adversely impact on water quality, water supply, soil erosion, air quality, highway congestion, scenic areas, and wildlife; would not unreasonably burden public services such as schools, fire, police, hospital and the like; and conforms with a duly adopted master plan.[116]

Density zoning, PUD ordinances, inclusion of environmental criteria in various development ordinances, and impact analysis requirements represent only the very basic promising approaches to site control. In addition, these action instruments may be useful in promoting a visually pleasing environment. (See Chapter 7 of this report.)

The choice of action instruments and their forceful application is perhaps the most crucial element in the guidance system planning process. It must be stressed again that it is highly unlikely that any one device alone will be sufficient. The coordinated application of a wide range of instruments is the essence and ultimate purpose of the environmental guidance system.

Stage 6: Feedback and Monitoring

The final stage in the guidance system planning process, feedback and monitoring, brings the process full circle. Evaluation of urban system performance is obviously necessary to maintain an adequate information system for ongoing planning. With respect to environmental quality objectives, some indicators of system performance may be formally designated and monitored: air quality; water quality; open space acreage; and public accessibility to open space. Yet, the objectives themselves change over time as public demand for a high quality environment increases. For example, the Environmental Development Agency of San Diego County, California is currently developing a regional environmental quality information system.[117] In addition to establishing indicators that are scientifically sound, they propose to interview selected officials of city and county government "to determine their views as to the relative importance, the format and the frequency of distributing environmental quality information."[118] The purpose of such interviews would be to insure that the information system was geared to the actual needs of decisionmakers as they respond to public concerns. They would be asked to rank various types of environmental degradation, expressed in terms of issues rather than scientific measurements.[119] They would also be asked to rank factors that may contribute positively to environmental quality, ("to what extent does the region satisfy man's desire for a varied landscape?").[120] Questionnaires of this sort could also be sent to a random sample of the public to periodically monitor their concerns with and perceptions of environmental quality.

The guidance system planning process depicted as the third front of innovation in land use-environmental quality planning remains largely a theoretical concept. Nowhere are all three fronts and the several stages of the guidance system planning process being coordinated. Yet, to a certain extent, it increasingly represents the organizing concept of much of the more innovative planning activity at the local level.

Perhaps the planning scene in California represents the most active current attempt to wrestle with the increasing application of environmental goals and information to land use planning as well as the increasing emphasis on carrying planning directly through to implementation--a trademark of guidance system planning. The combination of intensive urban development pressures, a fragile environment, and new state legislation are the three factors stimulating innovation in local planning in California.

The legislation encourages carrying planning through to implementation. As an illustration, counties and general-law cities are required to have prepared and adopted an open space element and or conservation element of the general plan by June 30, 1973. Most significantly, an action program, consisting of specific activities for implementation, is required as an integral part of the open space element plan. Furthermore, specific regulatory action in the form of an open space zoning ordinance is explicitly required, by June 30, 1973. This means that planning for open space in California cannot end with general proposals, but must include a specification of regulatory, financial, fiscal, institutional, and development, or conservation activities needed to achieve open space objectives. Furthermore, and an innovative aspect in its own right, is the requirement that the open space element plan, action program, and zoning ordinance should be consistent with each other. Developing a consistent package of plan, program, and ordinance may be a totally new experience for many local governments and will provide the opportunity to pursue the guidance system planning concept by pulling together various pieces of existing and proposed legislation into one ordinance and then coordinating it with program and the open space element of the general plan.

Since 1970, California legislation regarding subdivision regulations and zoning ordinances follows the same trend toward carrying planning through to implementation. For example, an attempt is made to introduce coherence to the planning and regulatory process at the local level by requiring that zoning ordinances and subdivision maps be consistent with the local general plan. Cities and counties are now required to deny approval to tentative or final subdivision maps if they are inconsistent with applicable general and specific plans, physically unsuited to the site, likely to cause substantial environmental damage or substantially avoidable injury to fish or wildlife or their habitat, serious public health problems, or conflict with public access easements. Thus the general plan has, in effect, become an instrument regulating the approval of subdivisions.

In contrast to what is being encouraged by the new California legislation, most innovating local planning agencies across the country have focused their efforts on perhaps one or two of the six stages depending upon which link in the process appears weakest or seems to offer the most potential for creating an effective planning operation. As a result, innovations with respect to reorienting the process to include environmental quality objectives are quite varied, and only a few examples of cutting edge approaches could be presented herein. The rapidity and ingenuity with which many local planners have responded to the rather recent emphasis on a quality environment and the degree to which this response has blossomed even during the course of this study may indicate that these innovations will become standard, if not dated, practice in future years. Nevertheless, the necessity to continually revise and improve the local environmental guidance system and the definition of comprehensive planning will remain a constant in a field of everchanging variables.

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CHAPTER 6

WATER RESOURCES MANAGEMENT: PLANNING AND CONTROL SYSTEMS

Page

Introduction 173

Watersheds 179
  Problem Definition 179
  Mainstream Planning and Guidance 181
  Cutting Edge Planning 182
  Natural Systems Approach 183
  Cutting Edge Guidance 184

Shorelands 187
  Problem Definition 187
  Mainstream Planning and Guidance 188
  Cutting Edge: Prediction, Policies, Data Collection and Analysis, Comprehensiveness, Guidance 188

Estuaries and Wetlands 194
  Problem Definition 194
  Mainstream Planning and Guidance 195
  Cutting Edge: Regional, Land Use Emphasis, Guidance 196

Floodplains 201
  Problem Definition 202
  Mainstream Planning and Guidance 203
  Cutting Edge: Flood Hazard Mapping, Comprehensiveness, Floodplain Regulations 205

Water Quality Management 220
  Problem Definition 220

Preceding page blank

Page

Mainstream Management 223

Cutting Edge: EPA Guidelines and A-95 Review, Comprehensive Planning, Comprehensive Management, Innovative Wastewater Treatment, Controls and Incentives, Policies, Public and Private Action 225

Storm Water Drainage 232

Problem Definition 233

Mainstream Management 235

Cutting Edge: Combined Sewer Alternatives, Land Use Alternatives 236

Urban Waterfronts 239

Problem Definition 240

Mainstream Management 241

Cutting Edge: Comprehensive Planning, Two Planning Approaches, Controls, Action Program 242

Metropolitan Integration 247

Cutting Edge: Multiple Purpose Planning, Multiple Means, Private and Public Coordination, Research, Comprehensive Planning, Regional Integration 251

CHAPTER 6

WATER RESOURCE MANAGEMENT: PLANNING AND CONTROL SYSTEMS FOR THE WATER-LAND USE INTERFACE

Introduction

Traditional urban water resource planning has generally dealt with water supply and sanitary sewer systems, which usually emphasize the supply or the demand side of the problem but give less attention to supply-demand interfaces, that is, water-land and water-land use interfaces. One recent attempt to focus on these interfaces identified four broad urban-water interfaces: water quality management; waterfront land use; water-based recreation and open space; and metropolitan growth control. These interface categories include the traditional, limited purpose, water and wastewater systems, but they also offer a more comprehensive perspective for the planning and management of such systems. Another comprehensive approach is the "residuals framework" in which interactions among environmental media (land, water, air) and urban activities[2] are emphasized. Similarly, "quality interchange frameworks" can be developed to focus on the interactions among media and urban activities (Figure 6-1).[3] These frameworks are particularly useful in detailing economic relations and implications or biologic and chemical processes.

Since this study focuses on urban planning and the relation of urban land use to environmental quality, a framework which distinguishes among broad types of land use is more useful. One such framework divides urbanized areas into four categories: undeveloped; developing; developed; and redeveloping.[4] The general significance of such a categorization is that different planning approaches and guidance techniques are appropriate for each category. In undeveloped or developing areas where the hydrology

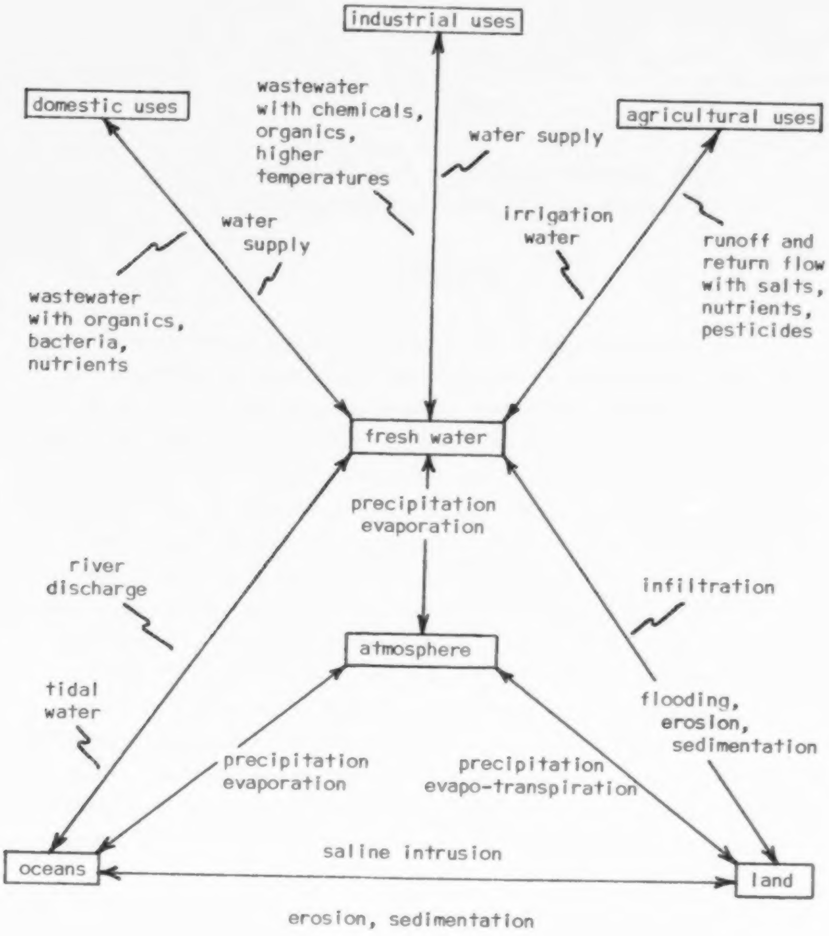

industrial uses
domestic uses
agricultural uses
wastewater with chemicals, organics, higher temperatures
water supply
water supply
irrigation water
runoff and return flow with salts, nutrients, pesticides
wastewater with organics, bacteria, nutrients
fresh water
precipitation evaporation
river discharge
infiltration
atmosphere
tidal water
flooding, erosion, sedimentation
precipitation evaporation
precipitation evapo-transpiration
saline intrusion
oceans
land
erosion, sedimentation

FIGURE 6-1

WATER QUALITY INTERCHANGES

is still in a somewhat natural state and land development decisions are still fairly flexible, it is possible to use planning and guidance to achieve near optimal water-land-land use environments, at least in terms of many environmental quality goals. In developed and redeveloping areas where water systems are largely manmade and land uses often frozen, the alternative is basically one of management and incremental improvement of the interfaces. This study treats the water-land-land use interface in terms of *undeveloped and developing areas* and *developed and redeveloping areas*.

The first category is typified by land and water areas that are now in a fairly natural state but which may be experiencing strong urbanization pressures and which are becoming key elements in the realization of environmental quality goals. The specific interfaces to be considered are:

1. Watersheds--particularly as related to runoff, sedimentation, recreation, water supply, and unique streams.
2. Shorelands--including natural lakes and large reservoirs.
3. Estuaries--including wetlands and coastal zones.
4. Flood plains--as a special element of a watershed.

The second category is typified by smaller scale urban areas in which water and sewer systems already exist and rivers, lakes, bays, and so on are being manipulated and degraded by urban activities. The key environmental quality issues here are not matters of preservation and ecology but rather are defined in terms of incremental improvements and remedial actions. The specific interfaces to be considered are:

1. Water quality management--including treatment and reclamation.
2. Stormwater drainage--including groundwater recharge.
3. Urban waterfronts--especially as related to deteriorating urban centers.

These two categories of water-land use interfaces, although fairly distinct in terms of rural versus urban or regional versus local characteristics, are not mutually exclusive and, in fact, have considerable overlap in urbanizing fringe areas. For example, the planning for and extension of sewerage facilities beyond city limits into urbanizing watersheds is a function that cuts across both categories of interfaces and is generally a question of metropolitan significance.

In attempting to define the water-land-land use framework, one must note three basic ways to manipulate water: (1) change its distribution in time; (2) change its distribution in space; and (3) change its quality. These changes occur naturally (runoff, erosion, evaporation) as well as via manmade facilities (reservoirs, water mains, sewers, treatment plants). As an area becomes increasingly urbanized, these functions become largely man-controlled. Thus, a developed area has extremely rigid or routinized distributions of water in time and space and often increasingly degraded water. In such cases most planning and guidance is focused on controlling runoff or improving the quality of the water via storm drainage works and wastewater treatment plants. In developing areas, planning and guidance can consider the total range of water manipulation and focus on creating near optimal distributions of water in time and space via controls and incentives.

Planning and guidance

Just as there are two distinct categories of water-land use interfaces, there are also two fairly distinct types of models of water resource planning and development. The first emphasizes long-range planning and development of water resources on a large scale while the latter involves the day-to-day management and operation of existing water use and control facilities.

River Basin Planning Model An example of planning for regional, developing, or undeveloped areas is the Water Resources Council's river basin planning program. Its basic methodology, like that of the Army Corps of Engineers, consists of four broad steps:[5]

1. Specification of objectives for water resource development;
2. Translation of objectives into specific criteria and planning guidelines;
3. Formulation and evaluation of alternative plans to satisfy the objectives and criteria;
4. Review of consequences of selected and/or implemented plans.

This model concentrates on long-range planning, broad objectives, alternatives and strategies, strong physical and economic relationships and criteria, and large-scale physical developments.[6] The model also assumes the existence of a strong regional agency, such as a district office of the Corps, which can implement selected plans; thus the emphasis is on planning, not guidance. This model is currently important, since the Environmental Protection Agency's guidelines for water quality planning identify "basin plans" and "area-wide plans."[7] The basin plans follow the model very closely, calling for a statement of objectives, a discussion of planning premises or criteria, a listing and an evaluation of alternatives. and an overall management strategy.

Urban Water Management Model There is no one accepted model for urban water resource planning and development, but a general outline can be compiled.[8] The basic elements of such a model include planning, administration, design, construction, operation, and maintenance. The urban model is generally more oriented to management than to planning activities. Although urban water resource agencies and departments may do some long-range or strategic planning, their basic functions (for example, designing specific facilities, constructing facilities, making inspections, levying charges, and operating and maintaining their systems) are management activities.[9] Thus, this model, in contrast to the river basin model, emphasizes specific local demands, a narrow range of alternatives, detailed rules for operation and maintenance, and the inclusion of non-structural measures such as service charges and service extension policies.

Another characteristic of this model is that it basically accepts and uses criteria and standards that are imposed by state and federal agencies. Since the urban agency or department receives its objectives and criteria from above and is constrained by existing systems and jurisdictions, it has little choice but to emphasize management and operation and to move in narrow and rather unimaginative directions.[10]

Urban Guidance Model Of the two water resource models, the river basin planning model is more of a planning model while the urban water management model is more of a guidance system. As discussed in Chapter 5, a guidance system consists of decision guides, such as plans and policies (derived in the planning model), and, more importantly, action instruments to be used in accordance with the decision guides.[11] The action instruments include channels of advice and information, controls or regulative measures, incentives of inducements, and developments or public investments. A guidance system is the means by which plans and policies can be implemented.

In general, the concept and use of the guidance system has been applied mostly to urban land use decisions. It has not been used in water quality planning or water resource development, and the urban water management that does take place has not been carried out in these terms or with such a broad range of implementation. This does not mean that river basin planning and urban water management are weak in implementation per se but rather that they have tended to rely on water-in-the-channel and construction-oriented alternatives and thus have not considered a broader guidance system approach, especially one in which complex water-land use interrelationships are emphasized.

Planning and Guidance Integration Since each of the models has a particular strength, it seems that some sort of integration is required for meaningful water resource development as it relates to urban land use planning and environmental quality in general. What is needed is a combination of regional objectives and long-range planning perspective, urban management and operation expertise, and more broadly focused urban land use guidance strategy and tools. This is particularly true at the metropolitan level where the two types of water-land use interfaces tend to overlap.

There have been some attempts to define an integration of regional planning with local guidance and management, but there have been few, if any, successful attempts to apply it.[12] In the late 1960's,[13] the Northeastern Illinois Planning Commission developed an approach composed of water management strategies rather than a specific water development plan. The strategies emphasized flexibility, various guidance measures (such as flood plain zoning, blue-green development, and economic incentives), strong relationships with land use planning and existing patterns of development, coordination and communication with all levels of government and water related agencies, and rigorous economic and social evaluations. This attempt at "regional integration" was not very successful except in terms of advice and information, because the Commission is only an advisory body and the State of Illinois was not receptive to this new approach.

Watersheds

Of the four types of developing, or urbanizing, water-land interfaces (watersheds, shorelands, estuarine wetlands, and floodplains), watersheds are the most comprehensive and perhaps the most significant, because they often include other interfaces and because most urbanization (at the fringe of metropolitan areas) takes place in small watersheds. Although watersheds are simple in concept, they are much more difficult to observe physically than shorelands or wetlands, especially in highly urbanized areas where watersheds virtually disappear except in terms of sewer networks.

A watershed is an area characterized by hydrologic unity or continuity. Given a specific point of a stream or river, the watershed is all the land area from which water (runoff) drains to that point. It is a well-defined unit in terms of hydrology and topography (via ridges and divides) but not in terms of indices of urbanization or social organization. Governmental units, economic activities, and social ties typically cut across watersheds and may exist in almost total independence.[14] This is not to suggest that watersheds are not an essential unit for planning and guidance, but, in using the watershed as a unit, important linkages to other systems must be considered.

Problem Definition

Most of the problems encountered in a watershed as urbanization takes place are related to the incompatibility of the watershed system with the political and economic systems trying to guide this urbanization. A classic example is the case of the Patuxent River Basin in Maryland.[15]

This fairly large watershed lies between two rapidly expanding metropolitan areas, Baltimore and Washington, D. C., and includes several counties and small towns. It is still relatively undeveloped but as urbanization continues many problems will arise. The following problems are significant in this watershed and typical of most developing watersheds:

1. Waste water disposal--in the early stages of development, problems center on the use of septic tanks and inefficient package treatment plants; later the question is largely one of who should provide public facilities and whether local wastewater should be diverted out of the watershed or integrated into a regional system.
2. Water supply--early development can usually use groundwater, but as urbanization continues it must be supplied from metropolitan systems, or surface water in the watershed itself must be impounded. Special problems can arise when the watershed is already being used to supply outside urban areas as is the case with the Patuxent basin. The watershed which is used for water supply will have serious conflicts with the need for water for waste assimilation and the pressures to build within the watershed, thus altering the quality and yield of the supply.
3. Parks, open space, recreation--these needs are not necessarily related to water but the existence of flowing streams or impounded water places a great demand on watersheds for recreation and amenity uses; this adds a third element of conflict to the water supply-waste disposal problem.
4. Erosion and sedimentation--this problem is the most severe in areas undergoing transition from rural to urban; it not only affects water quality but also changes the hydrology and ecology of the streams.
5. Urban runoff--urbanization changes the nature of stream flow in a watershed as more of the land area becomes impervious and served by storm sewers; the results are higher peak flows

(causing floods), lower dry period flows, and degraded water quality.[16]

6. Preservation--this problem cuts across some of the others, but has recently become an issue in itself. Interest groups and the public in general have become increasingly concerned over the preservation of watersheds and unique streams for ecologic, amenity, historical, and wildlife values.[17]

Mainstream Planning and Guidance

The mainstream or typical planning for small watersheds falls into two categories: rural conservation planning, for example that done by the Soil Conservation Service; and urban utility system extension planning: that is, for city, county, and metropolitan agencies.

Watershed conservation planning (SCS)[18] covers 95 percent of all agricultural land in the United States via soil conservation districts. Its main objectives are to control flooding and erosion, improve agriculture productivity, and provide some recreation, fish and wildlife, and water supply benefits. The usual plan elements are one or more small impoundments, soil conservation measures, and stream channel improvements, while the guidance system includes technical and financial assistance provided by the SCS, the above structural measures, and some use of easements.

The main objective of utility system extension planning and guidance[19] is to efficiently meet new demands. Plan elements are water impoundments, new interceptors, water mains, treatment plants, and the like. These physical developments are related to projected demands, water quality standards, and watershed hydrology and topography, but relationships to land use planning and guidance and overall environmental and social objectives are usually ignored. This process of planning and guidance, which generally consists almost entirely of public investment, is self-contained and isolated from other sectors of urban planning and development. Also, the process often involves overlapping or competing jurisdictions, such as city and county, and may produce inefficient systems.

Cutting Edge Planning

One of the best examples of innovative watershed planning in an urbanizing area was developed by the Southeastern Wisconsin Regional Planning Commission. The region, which includes the city of Milwaukee and seven surrounding counties, cuts across several small watersheds. The Commission is involved in an extensive program of planning and guidance for these watersheds and has completed studies for three of them.[20] The significance of this plan is that it combines many features of river basin planning with urban management and guidance models described earlier. SEWRPC took the watershed as the basic planning unit and since the watersheds involved are much smaller than those typically involved in river basin planning, the planning is much more comprehensive. The watershed planning is based on existing land use and transportation plans prepared by the Commission and is done, in part, to update and refine these plans. The planning is done within a strong framework of objectives, planning principles, economic criteria, basic data, and technical expertise, in cooperation with advisory committees established by the Commission. Although the watershed studies emphasize planning, the Commission is also concerned about guidance elements, such as zoning, land acquisition, algae control and weed harvesting programs, soil conservation measures, flood warning programs, and the like. Much of the success in Southeastern Wisconsin is due to close cooperation among implementing agencies via advisory committees, precise data and project plans provided by the Commission, and strong state resource protection laws.

The watershed planning process as defined by SEWRPC consists of seven steps or stages:

1. Study design, focusing on problem definition along with the development of guidelines for data collection, plan formulation, and evaluation.
2. Objectives and standards, arrived at with extensive help from citizen, government, and technical advisory committees.
3. Inventory, determined by massive data collection, emphasis on engineering detail and hydrologic simulation in order to make the plans authoritative and the implementation soundly based.

4. Analysis and forecast, using mathematical simulation models to predict urbanization and its effect on watershed hydrology and hydraulics under different structural and non-structural measures.
5. Plan design, with formulation of alternative sets of individual plan elements, which clearly present alternatives and their implications.
6. Plan test and evaluation, review of plan alternatives on the basis of engineering performance, technical and economic feasibility, legality, and political reaction. Plans are ranked on the basis of net economic benefits, ability to meet objectives and standards, and likelihood of implementation.
7. Plan selection and adoption; after public meetings and hearings to obtain citizen inputs, the Commission recommends a single plan.

Natural Systems Approach

Another means of watershed planning might be termed the natural systems approach. A representative example is the Potomac River Basin Study,[21] which collected and interpreted data in order to understand the basin's natural processes; then determined intrinsic land use suitabilities; and finally designated compatibility of each land use with the natural features. (See the Natural Systems Inventory section in Chapter 5.)

Although this approach may go beyond the SEWRPC's in considering natural relationships and ecologic principles, it does not have the sense of reality and is not integrated with the decision-making process as is the SEWRPC plan. The natural systems analysis approach relies heavily on the study team's personal values rather than on community objectives. It produces plans that are idealistic and somewhat vague and thus difficult to implement. In particular, such an approach, although strongly concerned with land use, is, in fact, often isolated from on-going land use planning and guiding processes.

However, this approach can be useful in resolving specific watershed problems or in evaluating specific project proposals. A case in point is the Skippack Watershed in Montgomery County, Pennsylvania, where the Corps of Engineers proposed a large reservoir.[22] The County retained a consulting team which made an ecological study of the watershed that led to abandonment of the reservoir proposal. In this case the natural systems approach could go beyond land use compatability tables and specifically evaluate the proposed project and various alternatives to it, thus becoming an important element in the decision-making process.

While most examples of natural systems analysis have been one-shot studies by consultants, a few on-going planning agencies have attempted to incorporate many features of this analysis into their planning processes. Lacking expertise and finances, however, these agencies can achieve only limited comprehensiveness and depth. One such agency, the Bucks County Planning Commission, developed a natural resource plan on the basis of various natural data and the tolerance of each natural area or process to certain land uses.[23] This study also proposed implementation tools, and the Commission is presently expending considerable effort on plan implementation.

Cutting Edge Guidance

This section largely consists of a listing of various elements of a watershed guidance system. These elements or tools are grouped under the categories of advice, controls, incentives, and developments or public investments. They are chosen to be "cutting edge" either because they are innovative or because they are being used effectively.

Advice

Soil development guideline reports[24]
Shoreland and floodland guideline reports[25]
Model ordinances (zoning, sanitary, building)
Watershed advisory committees (citizen and technical)
Watershed development plans
Detailed watershed and natural process data (e.g., exact boundaries of floodplains and wetlands)
Basic watershed and ecologic principles and "rules"[26]
Conservation commissions[27]

Public forums, meetings and workshops[28]
ERME (the "Environmental Resources Management Element" of a comprehensive plan has been used to establish multi-disciplinary, intergovernmental task forces to provide information and advice for local governments and planning agencies)[29]

Controls

Zoning (general zoning, floodplain zoning)
Subdivision ordinances (e.g., dedication of floodplains)
Sanitary ordinances (e.g., control of septic tanks)
Building ordinances and permits
Special zoning regulations (tree cutting, dumping, stream standards)
"Act 442" (This is a Pennsylvania law that permits a county to purchase land, attach restrictions to it, and then sell or lease it. This act used in conjunction with planned unit development concepts and possible tax incentives is being actively explored in Bucks County.[30]
Conservation easements[31]
Construction-erosion regulations[32]

Incentives

Federal grant programs. These programs offer strong incentives to local governments to construct water supply and waste disposal facilities for both economic development and environmental protection purposes; however, they tend to hide the real costs of construction and thus to eliminate non-structural alternatives. They also tend to reduce local and state initiative to formulate their own policies and plans for development.[33]

Utility extension policies. Such policies, especially for extension of sanitary sewers, can be effective in limiting development in vulnerable areas, encouraging high density and contiguous development, and abating existing pollution problems.[34]

Utility pricing policies. Surcharges on industrial effluents can be a significant incentive on industries to clean up their discharges or at least to help finance municipal treatment of these discharges. They also encourage more efficient use of water resources.

Tax policies. These can range from tax write-offs on construction of new facilities to preferential tax assessments on land help for preservation purposes. For example, a "Greenway Tax Law" is proposed that would reduce the property tax on woodlands if the owners agree to place them in a woodland management program.[35]

A-95 review and environmental impact statements. Although the procedures and criteria for review of local projects and plans are not yet well established, such review is a key incentive for local, state, and federal agencies to pay much more attention to the environmental effects of their actions. Some states, such as California, are far ahead in the preparation, review, and evaluation of impact statements. The general effect of NEPA (section 102) has been to force agencies to think about and disclose the effects of their actions.[36] In particular, the watershed is a significant unit in which to consider ecologic impacts.[37] In line with the intent of A-95 review, North Carolina passed, in 1971, a regional water supply act and a regional sewage disposal act to review local plans for regional compatibility and to aid local agencies to integrate their water resource systems and planning.[38]

Developments

Dams, reservoirs, impoundments.
Channels, levees, dikes.
Sewerage and water supply systems including regional integration and advanced treatment.
Land acquisition.
Management programs (algae control, weed harvesting, woodlands, soil conservation, wildlife).
Diversions (water supply and wastewater).
Low-flow augmentation.

Public investment in these projects or programs is not new, but through a coordinated program of planning and guidance each project can be seen in proper perspective and used to optimize total watershed environment. For example, without proper integration with land use planning and local needs, some developments, such as reservoirs, tend to dominate a guidance system.

"Blue-green development." This is a multiple-purpose urban development project that stores storm water at the site rather than immediately passing it on downstream. An example is a tennis court, or other recreational area, that serves as a small impoundment during storms.[39] Such development is presently uncommon although it has been advocated for years. The Chicago Metropolitan Sanitary District now requires this of large new developments if they want to receive service.[40]

Wastewater reclamation (Muskegon County, Michigan, sprays wastewater over large land areas where it is naturally treated and recharged.)[41]

Shorelands

Shorelands are areas of land adjacent to streams and inland lakes. They are generally part of a watershed, thus much of the previous discussion is applicable here. However, the shoreland is a special case within the watershed framework with significant problems that warrant special treatment.

A useful definition of shoreland includes the land area adjacent to a stream or lake that has significant effects (for example, sedimentation, septic tank seepage) on the quality of the stream or lake. In Wisconsin, a shoreland is defined as the area up to 1,000 feet from lakes and 300 feet from streams. The Corps of Engineers is presently concerned with adjacent land up to 300 feet from the reservoir or up to five feet above the high water surface. The geographical scope of the shoreland should depend upon the specific nature of the area and its problems.[42]

Problem Definition

The basic problems found in shoreland development are generally the same as those discussed for watersheds. The special nature of much shoreland development--largely recreation and seasonally occupied--often makes these problems more critical. Much shoreland development is (1) done by amateurs with little experience in lot subdivision or housing construction, (2) for consumers who are concerned only about being near the water, (3) and under almost no governmental control, such as sanitary ordinances or subdivision regulations.[43] Some of the problems are:[44]

1. Substandard housing (low-quality cottages on small lots; dirt streets; lack of utilities)
2. Degraded water quality (septic tanks on small lots, poor soils, and high water tables; erosion from land clearing,

draining, and filling)

3. Loss of aesthetic quality (tree cutting, litter; restriction of public access)
4. Disruption of the natural ecology (dredging, draining, filling, cutting; nutrients, sediments)
5. Water use conflicts (recreation, water supply, flood control; water skiing vs. fishing and/or swimming)

Mainstream Planning and Guidance

Planning and guidance on many developing shoreland areas are virtually non-existent. This is often the case because many lakes and streams, particularly new manmade lakes, are located in rural counties that have no planning expertise or even basic development ordinances. Even where some planning or simple ordinances exist, the economic pressures are often far too great for any local attempts to control development. Likewise, the county or even a nearby city may not have the resources to provide basic services such as water and sewer facilities and may be hard pressed to supply even law enforcement

The only significant planning, especially on manmade lakes, is done by state and federal agencies, such as the Corps of Engineers, for recreation purposes. For example, the Corps has developed fifty-three recreational areas on Lake Sidney Lanier in northern Georgia.[45] Other sites have been leased to state agencies and authorities. However, these efforts are not aimed at residential development and cover only a portion of the total shoreland.

Cutting Edge: Prediction

Probably the best attempt at understanding the nature of shoreland development processes, i.e. developer and consumer decision-making, has been made by the Center for Urban and Regional Studies at the University of North Carolina.[46] Its research team has studied the development process at several manmade lakes in the southeastern United States and has reported its findings to concerned planning agencies, like the Centralina Council of Governments.[47]

The development process seems to consist of key development decisions, decision agents--such as landowners, developers, and consumers--and a sequence of states. These elements and various parameters related to them--such as ground cover, drawdown, accessibility to the water, availability of utilities, and aesthetic quality--were used to develop a simulation model that describes and predicts development along shorelands. The model can be used to determine areas where development is most likely to occur under various assumptions as to the level of planning and guidance imposed. This model can become an important first step in defining the problems that are likely to occur and in evaluating and suggesting various planning and guidance tools to help solve them.

Policies

A significant attempt to formulate shoreland goals and policies was undertaken by the Muskegon Metropolitan Planning Commission.[48] Shoreland goals were hypothesized in the broad areas of society, environment, economics, and politics. These broad goals were then specified by definition with regard to local, county, and regional interests. The goals were then tested by public opinion surveys, and specific policies were formulated.

> Regional policies--enact state legislation to improve planning and guidance, especially to prohibit development in certain areas. Establish a regional planning agency, and promote part of the shorelands as an area of unique environmental opportunity for recreational-residential development.
>
> County policies--adopt countywide development policies and controls; expand existing shoreland parks; develop a scenic transportation route along the shoreland (along Lake Michigan); and establish joint programs with local governments, especially for cost-sharing.
>
> Local policies--acquire undeveloped areas and off-shore dunes for parks; promote large-scale tourism and recreational development; enact ordinances to protect environmental and economic opportunities of the shorelands; and coordinate local programs to assure maximum utilization of the shorelands in the public interest.

The key issue in this attempt appears to be the basic conflict between preservation of environmental quality and use of environmental resources for economic development. Inherent in the Muskegon policies is the assumption that it is possible to have some integration of preservation and development goals, but it is noticeable that as the policy level goes from regional to local there is a shift in emphasis from preservation to economic development.

Data Collection and Analysis

The Southeastern Wisconsin Regional Planning Commission was described in the section on watersheds as being particularly strong in the areas of data collection and analysis for water resource planning and guidance. One important aspect of its data collection program involves a cooperative effort with the Wisconsin Department of Natural Resources. The Department has prepared for use by SEWRPC numerous studies of lakes in southeastern Wisconsin.[49]

One series of studies is a group of lake use reports for the approximately fifty significant lakes in the Fox and Milwaukee River watersheds.[50] The reports include a physical description of the lake (the watershed, shoreland, soils), water quality, the lake as resource (its fish and wildlife, aquatic plants, and aesthetic features), and use for fishing, swimming, boating, and residences. The reports also look at existing land use, sewerage systems, and local ordinances. The final sections discuss the major problems, such as deteriorating water quality, and recommend guidance measures. These reports have become a significant source of data for shoreland and watershed planning not only for SEWRPC in its regional efforts but also for local agencies and governments.

Comprehensiveness

A good example of a comprehensive planning and guidance effort for a shoreland area is the Chattahooche Corridor Study,[51] which covers a forty-eight mile stretch of the river above Atlanta, extending 2,000 feet on each side. It includes statements of assumptions and goals, planning process, key features of a proposed plan for the corridor, and a means to implement the plan.

Key assumptions for the planning process are that the river and corridor will be urban (it would be impossible to completely prevent urban development in this area) and that the major responsibility for guiding urban development lies with local governments. The primary goals involved are preservation of river water quality, protection of certain aesthetic or historic areas, and minimization of adverse environmental impacts of urban development. The planning process has three main elements:

1. Analysis of vulnerability, including analysis of water quality, processes that affect this quality, and impact of urban development on these processes; analysis of shoreland in terms of soils, geology, hydrology, land cover, and slope to determine vulnerability of land areas to adverse impacts from urban development; and various standards for locating development.
2. Inventory, including scenic, historic, and unique features plus existing land use and facilities and proposed public and private developments.
3. Plan formulation, based on vulnerability criteria, inventories, projected demands for recreation, various fiscal and political constraints, and the existing metropolitan planning framework. Basic plan elements are policies on bridge crossings, water and sewer extensions, and areas for open space preservation, along with delineation of areas suitable for urban development, farming, and planned unit developments.

Guidance

Many watershed guidance tools are also applicable to shorelands. This listing focuses on guidance measures particularly relevant for shorelands.

Advice

Shoreland development guide--a complete discussion of shoreland problems; a detailed description of shoreland and water quality protection measures; a discussion of statutory authority, ordinance adoption procedures, and enforcement programs; and several appendices including model ordinances, State acts, State programs, and existing local ordinances.[52]

Such a shoreland development guide, complete with maps and diagrams defining shoreland boundaries and illustrating good development practices, distributed to local governments, planning agencies, and private developers is perhaps the most important means of advice. The guide will influence local decision-making and serve as an authoritative basis for intergovernmental communication and coordination. This is particularly true if the guide is part of a comprehensive planning process and complementary to other planning reports and guides.

Controls

Mandatory shoreland ordinances (zoning, sanitary, and subdivision ordinances with a building permit system, which would control minimum lot sizes, setbacks from the water, tree cutting, filling, draining, dredging, and size, location, and operation of septic tanks)

In 1965, Wisconsin passed a law requiring all counties to regulate shoreland development by 1968 or the state would do it.[53] A task force composed of the state Departments of Natural Resources, Conservation, and Health plus the U. S. Soil Conservation Service and the University of Wisconsin Extension Division established minimum standards and formulated model ordinances. Although the 1968 deadline was not met, the state continued to work with counties, and by 1971 all had shoreland ordinances. The Wisconsin program has some weaknesses in that the law does not apply to incorporated areas and many of the ordinances are somewhat simplistic, but the fact remains that now every county in the state has some form of planning and zoning body plus a sanitary ordinance.

Incentives

State assistance and review (financial and technical assistance for planning and formulation of controls; state or regional review of local plans and enforcement procedures)

Development

Planned community development (comprehensively planned and controlled development of small communities and recreation facilities on shorelands)

A division of Duke Power Company, Crescent Land and Timber Corporation, has purchased 75 percent of the shoreland around Duke Power's Lake Keowee in South Carolina.[54] Development will maximize the land's recreational and residential potential, and Crescent has developed a plan for this development with help from federal, state, and local agencies. Sites have been set aside for parks, public access areas, residential areas, and mobile home parks. The actual development is to be carried out by large, experienced private developers via a contract with Crescent. These contracts are precise about requirements and set restrictions similar to subdivision regulations.

A shoreland management program[55]

1. Comprehensive water use planning, by watershed (desired uses; water quality standards; land use planning)

2. Correction of shoreland problems

    a. Export wastes from basin
    b. Public acquisition of shoreland; easements
    c. Redevelop old areas
    d. Restore lakes (flushing, aeration)
    e. Harvest undesirable plants and animals
    f. Restock fish; replant

3. Abatement of water pollution

    a. Improved waste treatment
    b. Low flow augmentation
    c. Replace septic tanks
    d. Soil and water conservation (terraces, ponds, spillways, basins, channels, contour tillage)

4. Prevention of shoreland problems

    a. Zoning (residential, agricultural, parkway, flood plain, cluster)
    b. Special regulations (cutting, clearing, building)
    c. Subdivision regulations (utilities, dedication, platting)
    d. Sanitary ordinances (permits for septic tanks)
    e. Recreation ordinances (uses restricted to certain areas)

Estuaries and Wetlands

In general, an estuary is that part of the hydrologic system where surface waters from streams or rivers mix with salt water from the oceans under the influence of tidal action.[56] Most U. S. estuaries are shallow and are bordered by marshes or wetlands and mud and sand flats. The essential estuarine process is the mixing of fresh and salt water. This is affected primarily by tidal action as a "salt wedge" of denser water comes in with the tide. The mixing and resultant flushing out of the estuary may take place within a single cycle of the tide, but in large, complicated estuaries it may take several months.

A second key process involves the nutrients and sediments brought in by the fresh water. Estuaries become nutrient traps and are therefore highly biologically productive. Similarly, the adjacent wetlands are also significant biological areas as they are vital to the chain of marine life. The exact delineation of a wetland area is a difficult task, however, tidal wetlands can be defined by existing plant species and tidal characteristics.[57]

Problem Definition

Problems of estuaries and wetlands include degradation of water quality, loss of habitat for fish and wildlife, loss of public access to beaches and natural areas, and disruption of ecologic processes. These problems exist in other water-land interfaces but they are perhaps most critical in estuarine areas, since the estuary of all water-land interfaces is the most complex and the most sensitive. The ecological balance and functions of the estuary depend on a number of factors (fresh water inflow, temperature, sediment load, level of nutrients); if any factors are changed, the processes and the quality of the estuary may be radically affected. William Odum has pointed out that "all of the factors which enable an estuary to concentrate and recycle nutrients also allow the estuary to become a pollution sink."[58]

The following is a list of activities common to urban development that may significantly affect the estuarine area:[59]

1. damming--dams across the streams feeding into the estuary may decrease the flow of fresh water and the sediment load. Dams near oceans keep out salt water and destroy the mixing process.
2. filling--filling in the wetlands and the estuary itself obviously reduces the available area in which the biologic process can take place.
3. dredging--dredging estuary bottoms and wetlands may significantly disrupt biologic processes; also, since it is often done for private boating, it adds to the wastes discharged into the estuary.
4. diversions--use of fresh water for water supply and irrigation reduces the amount of fresh water reaching the estuary.
5. waste discharge--wastewater effluent significantly affects the nutrient level in the estuary; also, the use of fresh water for cooling by power plants raises the temperature of the water.
6. land practices--use of land for farming, residential development, and mining significantly affects the sediment load in fresh water. Increased sediment loads can cause shoaling and affect the biologic processes.
7. pesticides--a large amount of pesticides used on land end up in the estuary and its plants and animals.

Mainstream Planning and Guidance

Planning and guidance for estuarine areas really only came into existence in the late 1960's. National awareness of the problems involved began in 1964 at a symposium on estuaries held by the American Society of Limnology and Oceanography. Since then, there have been a number of similar symposia, congressional appraisals, and national studies.[60] This activity is still in the problem definition stage, and one of its principal objectives is to define exactly who should plan and guide estuaries.

The urban planning and guidance that has taken place is basically concerned with the use and development of estuarine areas for commercial purposes (cheap residential land, simple wastewater disposal, intensive recreation) and has not addressed itself to the broader functions of the area or to planning it as a whole. A great deal of estuarine planning and development is done by the Corps of Engineers for navigation or flood control and ignores the biologic nature of the resource. Similarly local governments have allowed developers to fill in wetlands, dredge channels for boats, discharge wastewater into the estuaries, and divert fresh water.

Cutting Edge: Regional

One well-known example of estuary planning is the San Francisco Bay. This estuarine area, including the adjacent delta and watershed, lies within a single state, California, a progressive state in water resource planning and development. Even here, a largely uncoordinated complexity of jurisdictions and planning activities has developed. Three principal agencies involved are the Bay Conservation and Development Commission (BCDC), the Association of Bay Area Governments (ABAG), and the San Francisco Bay-Delta section of the California Water Quality Control Board. The BCDC and the Bay-Delta section have recently completed significant planning studies.[61]

The Bay-Delta study looks not only at the Bay but also at the Delta and the Streams feeding into the Bay. The study was broken into the following sections:

1. Description of Bay and Delta--use of the Bay for navigation, recreation, and cooling water; importance of the wetlands; use of the Delta for agriculture, recreation, industry and domestic water supply.
2. Influences on water quality--municipal and industrial wastewater; agricultural runoff, urban runoff; dredging and filling.
3. Water quality problems--increases of nutrients and algae in the Bay; salt water intrusions into the Delta and related diversions of water out of the region; loss of fish species; increased levels of toxicants.

4. Water quality management--control of wastewater and recycling; increased dilution capability; importance of the location of wastewater discharges.
5. Management plan--federal and state agencies to control fresh water flows and diversions and enforce water quality standards; regional agencies to treat and divert wastewater flows; local agencies to control urban runoff. The basic elements of the plan are treatment of wastewater on a regional basis, diversion of discharges to good assimilative areas (for example, the center of the Bay or the ocean), and wastewater reclamation when it becomes feasible.
6. Implementation--creation of a regional service agency for wastewater disposal.

Although the Bay-Delta study is geographically and ecologically comprehensive, it is limited in its plan and implementation recommendations. The plan is basically an engineering-technological one, while implementation procedures focused on a single, new service agency. Numerous land use control and non-structural measures are not included, and the active use of local agencies and governments for implementation is not considered.

The BCDC study and plan, though limited in geographic scope, is a good example of utilization of land use controls and coordination with local governments.[62] The basic objectives of the Commission are to protect the Bay as a natural resource but to promote development of the shoreline with minimum filling. The Commission, realizing the importance of public support and the uncertain nature of its own powers, took a strong education and public relations approach, which included an extensive study of the Bay under twenty-five categories (pollution, marshes and mudflats, fish and wildlife, recreation, appearance and design, waterfront industry and housing, ports). The significance of these studies was not so much the enclosed information but the public awareness they generated as each report was individually reviewed by affected parties and interdisciplinary committees, then published with long press releases. The final plan, developing out of conflict resolutions among participating groups, was widely known and understood and had implicit support from most local agencies and interests.

The essence of the plan and the Commission's regulatory powers relate to dredging and filling the Bay's shorelands. The Commission has established various policies on the use of shorelands and related dredging and filling. These include identification of certain high priority uses (such as regional ports, transportation, and recreational facilities) for which land is reserved and filling permitted, establishment of a permit system procedure for filling and dredging, policies on public access, wetland management, and appearance of shoreland development, and coordination with local government.

The Commission was made permanent in 1969 by the California legislature but was not given all the authority it requested. It was granted control over only the first 100 feet back from the Bay. Thus, it can require public access to the Bay and control some filling and dredging via permits, but it must still rely on public education and local government cooperation.

Land Use Emphasis

One of the most recent examples of an estuary planning study is from the Tampa Bay Regional Planning Council.[63] The study area includes Tampa Bay and the coastal wetlands and inlets of five adjacent counties. Unlike many "estuary studies," this one focuses on adjacent land use and land management programs. Although the study includes a geophysical sketch (climate, geology, topography, soils, hydrology), an ecological sketch (estuarine processes, fish and wildlife), an historical sketch (transportation, tourism, military installations), and a discussion of shoreline characteristics (tides, waves, beaches), it is particularly interested in projected land use patterns, suitability of the land to support these patterns, and governmental roles in managing this land use.

The planning approach produced two plans. One emphasized the intrinsic suitability of various land areas and the limited nature of local water supplies as key limitations on growth and channeled land uses away from estuarine and wetland areas. A second plan, recognizing general resistance to land use controls and the strong tourist, retirement, and recreational-residential development forces, preserves only the most critical areas, but nevertheless advocates as much land use control as is feasible.

In relation to intrinsic land suitabilities, the Council consulted with the Florida Coastal Coordinating Council and identified three broad categories:[64]

1. Preservation--areas to be protected from further development, such as marine grass beds, tidal marshes, fresh water swamps, and shellfish waters.
2. Conservation--areas recommended for limited land uses such as recreation, forestry, wildlife management, and agriculture.
3. Development--areas suitable for urban development but may require special drainage and sewerage systems and central water supplies.

A key concept of the study is that implementation of the plan and any land use controls depend on local government. It calls upon local agencies to become more responsible and innovative in their planning, zoning, and general decision-making processes, including a recommendation to require environmental impact statements for all new private development.

Guidance

Because of the regional nature of estuaries and wetlands and the strong pressures for economic development of these areas, local guidance programs have been ineffective or non-existent. The most effective estuarine guidance programs have been at the state level.[65]

Advice

Detailed studies of estuarine processes and problems
Estuarine shoreline development plans
Public hearings, meetings, workshops
Advisory Committees and consultants
Intrinsic suitability guides for estuarine areas
Estuary or coastal coordinating committees
Identification of relevant federal, state, and local
    acts and powers

Delineation of estuarine or coastal zones

Precise delineation of wetlands--determination of exact wetland boundaries is a key element in their preservation; the State of Connecticut in order to enforce its Tidal Wetlands Preservation Act (1969) has sent out biologist-engineer-surveyor teams to locate the exact boundaries;[66] however, the problem is even more severe for inland wetlands where basic data, e.g. soils, is lacking.

Controls

Coastal wetlands alteration laws [Massachusetts, Maine, Connecticut, and North Carolina have laws that prohibit dredging, filling or altering of coastal wetlands without a permit.[67] In some cases the permit can be issued by local governments but state approval is required; if the restrictions on the wetlands are found to be a taking (in court action), the state can pay a compensation (Connecticut) or purchase the land via eminent domain (Massachusetts).]

Aquatic preserves (Florida has recently established a statewide system of aquatic preserves,[68] where there can be no more selling or filling and dredging of submerged land for creating waterfront real estate; uses such as boating and fishing are allowed.)

Executive moratorium [The governor of Oregon placed a moratorium on all coastal area planning and development by state agencies (as of March 3, 1970), until the state can complete a comprehensive study and plan for the coastal zone.[69] The moratorium also directs state regulatory agencies to apply their authority to protect the coastal zone; the Oregon State Land Board, for example, now considers the filling of an estuarine area to be a form of permanent pollution.]

Bulkhead lines (Florida authorizes cities and counties to establish bulkhead lines beyond which no filling or bulkheading is allowed.)

Regional permit system (the BCDC for example)

Local subdivision controls, zoning, and building codes--these controls have never been successful in relation to estuarine areas.[70]

Incentives

State-local cooperative programs (The Long Island Wetlands Act establishes state-local cooperation to preserve wetlands and provides 50 percent funds for wetlands acquisition.)

State-regional programs (BCDC, for example)

A-95 review (This review power can be used by regional clearinghouses in estuarine areas to help control urban development, via HUD grant programs and Corps projects. The Tampa Bay Regional Planning Council sees this as a very important tool.[72] This is an incentive rather than a control because its effect is largely one of persuading governmental agencies to consider the environmental effects of their projects.)

Development

Land acquisition (Since the passage of a $60 million Green Acres bond issue in 1961, New Jersey has acquired about 53,000 acres of salt marsh and expects to acquire about 90 percent of the high-value coastal marshes in the state.)[73]

Management programs (New York develops and/or manages dedicated or purchased wetland areas in cooperation with local governments.)

Regional sewerage systems (The Bay-Delta study has proposed regional sewerage systems including discharge of treated wastewater outside the estuary or at least in its deep-water areas.[74] Such systems are necessary to prevent local pollution of shallow estuarine areas.)

Port and marina facilities.

Floodplains

In this section we are still primarily concerned with developing water-land interfaces rather than those that are already developed. Thus, the interest here is in flood control (or control of flood damages) rather than storm water drainage. The distinction between the two can be summarized as follows:[75]

Flood control--regional in nature; concentrates on watersheds and river basins; closely related to land use planning; involves preserving and developing natural systems; failure of system may result in major property damage and loss of life.

Storm water drainage--local in nature; includes municipal sewers; generally less directly related to land use planning; involves creating manmade systems; failure of system results in minor property damage and nuisance.

Our particular interest is in the flood plain which is the relatively flat and lowland area adjacent to a stream or river. This land either has been or is likely to be covered with flood water during periods of heavy rain or snow melt. The flood plain can be divided into subareas by its elevation above and proximity to the stream.[76] For example, the floodway is the area immediately adjacent to the stream and which is necessary for the passage of most flood flows. This area is often designated by encroachmemt lines and restricted from building and filling. Beyond the floodway other boundaries can be established corresponding to floods of selected probabilities, for example, the design flood and the standard project flood.[77] Within these boundaries there are different probabilities of flood occurrence and different recommended land uses.

Standard project flood limit	No restrictions
Ten-year flood limit	Controlled construction; parking, storage
Floodway	No construction or filling; agriculture and recreation permitted
River	

Problem Definition

The general nature of flood problems is fairly straightforward and well-documented. Given certain circumstances, such as heavy rains, snow melts, hurricanes, and saturated soils, rivers may overflow their banks and cause considerable damage to buildings and land, creating great hardship for people, including possible loss of life. At the time of the Flood Control Act of 1936, which placed great emphasis on flood control structures, flood problems were largely related to agricultural losses and a few special urban cases.[78] However, as the nation continued to grow and urban areas began to decentralize, especially by moving into the flat, economically attractive flood plains, flood hazard areas began to mushroom. The widescale development of flood plains was due largely to the view that flood control structures (dams, levees) were completely adequate to prevent flood damage. This view is true only up to a certain point (the level of the design flood), and this point can easily be surpassed with catastrophic results. The most recent example is the flooding this spring (1972) in several areas of Pennsylvania and Virginia; however, many of these areas had no flood protection structures.

Related to this reliance on flood control structures is the question of flood hazard perception and consequent adjustments.[79] The prospective flood plain developer or dweller will make decisions on the basis of his perception of the likelihood of flood hazard, which will be based on a number of factors: his previous experience with flooding and flood losses; the existence of flood control projects; his knowledge of what and where the flood plain is; his faith in public relief; and his personal disposition toward uncertainty. In general, flood plain development and consequent damages are largely due to a lack of understanding of the flood plain concept or its public delineation, an economic optimism that severely discounts improbable future losses, and a too-easy reliance on the effectiveness of flood control structures.

Mainstream Planning and Guidance

In discussing mainstream planning and guidance for flood damage prevention there are two important distinctions to be made: (1) the use of structural versus non-structural control measures and (2) the difference between planning and implementation. The following diagram uses these distinctions to characterize the mainstream and cutting edge planning and guidance of the recent past:

	Structural	Non-structural
Planning	Mainstream Corps since 1936 SCS since 1953	Mainstream TVA since 1953 USGS and the Corps Many cities and states in 1960's
Implementation (guidance)	Mainstream Corps since 1936 SCS	Cutting edge TVA and many cities in its region A few other cities and states

Mainstream planning and guidance appears to be of two types. One is the structurally oriented flood control programs carried out by the Corps of Engineers, the Soil Conservation Service, and other regionally oriented agencies. The second type involves the non-structural planning programs that have been attempted by various agencies since TVA began in the 1950's. These programs include flood hazard mapping by the USGS; flood hazard studies by the Corps for local interests; state assistance, enabling laws and studies for local flood control; and city and county studies of flood hazards with subsequent recommendations for non-structural control measures.[80] These planning programs are considered to be, for the most part, mainstream because the concepts and principles involved have been advocated for at least twenty years and formally set forth and widely disseminated for at least ten years.[81] However, these programs have largely remained in the realm of planning and "neglected advice" and so do not exactly fit the category of cutting edge or innovative. Although the distinction here is not always clear, unless the non-structural measures and policies are actually implemented (to complement structural measures) by local governments and agencies, they are not cutting edge.

The following diagram (Figure 6-2) is an example of a widely copied comprehensive flood damage prevention program prepared by TVA in 1962.

Cutting Edge: Flood Hazard Mapping

The best example of a comprehensive flood hazard mapping program for an urban area is that done by the Northeastern Illinois Planning Commission. In 1961, the Commission, in cooperation with the U. S. Geological Survey, the six counties in the area, several cities, and the Metropolitan Sanitary District of Greater Chicago, initiated a five-year program to compile all available flood data for the metropolitan area. The main output was a series of quadrangle maps and accompanying explanatory material defining and plotting flood hazard areas in the metropolitan region.[82] The maps were then used in a continuing program of assistance to city and county governments and agencies, particularly to help develop zoning, subdivision, and building regulations that take into account flood plains and flood control measures.

At the same time the Commission was preparing its landmark report on the general use and development of water resources.[83] This report used many of the non-structural concepts of flood plain management and extended them to or included them in comprehensive water resource planning and development strategies. Because of the advisory status of the Commission and a lack of strong state support, implementation of many of the policies and use of the information developed in these planning programs have not been widespread. However, the Metropolitan Sanitary District, a key implementation agency in the area, has moved to implement some of the planning program. For example, it requires on-site storm water storage for large development projects within the district in order for the project to receive service.

Most recently the Commission has prepared a model flood damage prevention ordinance,[84] which puts in rule form most regulations related to zoning, subdivision, and building codes that help to control flood damage. Before this single compilation, such regulations were scattered among several separate ordinance guides. This model ordinance is likely

FLOOD DAMAGE PREVENTION

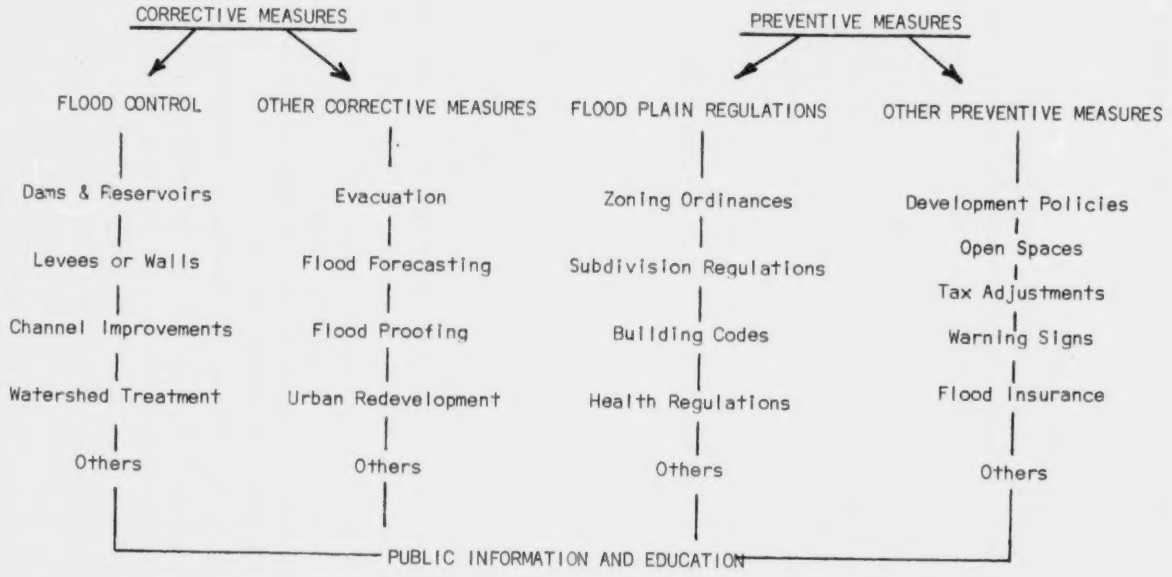


FIGURE 6-2

Source: Goddard and Gray, "Emerging Program for Managing Flood Losses," AIP Conference, Aug. 14, 1966.

to be particularly useful, not only because northeastern Illinois has a strong base of flood plain maps and policies, but also because in 1971 the Illinois legislature authorized state control of floodplains.[85] Although cities and counties have had the authorization to control flood plain development, they are now more likely to do it since the state may step in.

Comprehensiveness

Perhaps the most comprehensive planning and guidance program for flood damage prevention is that of the Southeastern Wisconsin Regional Planning Commission. The Commission's approach to water resource planning and development was discussed in the "watershed" section of this report. The flood damage prevention program is one element of the total planning and guidance program and thus is based on regional land use and transportation plans, watershed plans, and an elaborate process of objectives and criteria formulation and plan evaluation. Although SEWRPC, like NIPC, is basically an advisory agency, its strong framework of detailed plans and policies and its success with intergovernmental cooperation make its flood damage prevention program more likely to be implemented. In addition, the Commission's efforts are supported by strong state laws on flood plain management.[86]

The SEWRPC program is adapted from the TVA program and is oriented to both developed and developing urban areas. It is divided into four parts:[87]

1. Protection of existing development (flood control works, flood warning, evacuation, floodproofing)
2. Removal of existing development (urban renewal, public acquisition, razing or elimination as a nonconforming use or public nuisance, conversion of use)
3. Discouragement of new development (education through flood hazard maps, warning signs, tax assessment policies, financing policies, public development policies, flood insurance programs)
4. Regulation of existing and new development (general zoning

districts, special zoning restrictions in floodplain areas, subdivision ordinances, sanitary ordinances, building ordinances)[88]

The SEWRPC feels that regulation is the best means of implementation for flood damage protection because protection is costly, removal is difficult, and discouragement uncertain. However, one important distinction is made by the Commission: although the simple approach of zoning districts may be adequate in undeveloped areas, it is not satisfactory in urbanizing or developing areas; therefore, in developing areas, the Commission recommends special floodland regulations be used in conjunction with general zoning districts. See Figure 6-3.

The Commission in all its programs places a strong emphasis on intergovernmental relations and advisory committees, identifying state and local powers and federal assistance opportunities, and involving local, state, and federal agencies throughout the planning process so they come to have a vested interest in program implementation. Thus, an important part of the flood damage prevention program is identification of statutory authority, governmental programs, and intergovernmental relations. See Figure 6-4 for a summary of this effort.

Flood Plain Regulations

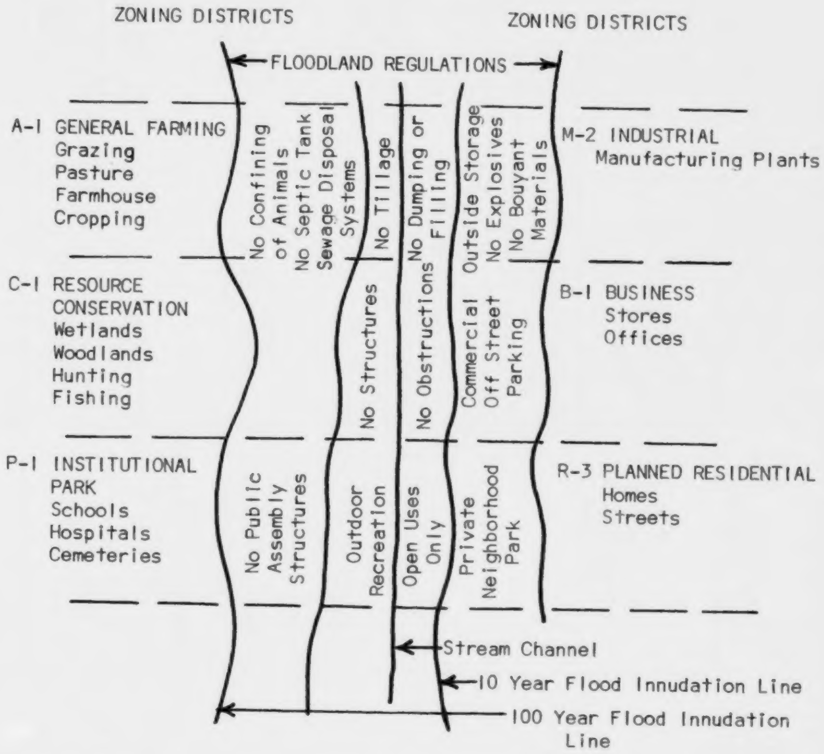
Two states that have enabled and encouraged their counties and cities to adopt flood plain regulations are California and Wisconsin. California adopted the Cobey-Alquist Flood Plain Management Act which makes it state policy to encourage local governments to plan for and regulate flood plain uses. The act provides state assistance and requires adoption of flood plain regulations as a prerequisite for state funds to pay local costs of federal flood control projects.

Wisconsin established a strong statewide flood plain program in 1966. It set up general criteria for flood plain regulations and warned that if any county or city had not adopted reasonable regulations by 1968, the state would do it.[89] This deadline, like the shoreland regulation deadline, was not meant to be final, but rather to encourage local governments to begin to deal seriously with their problems.

Some examples of local flood plain regulations appear in Figure 6-5.[90]

FIGURE 6-3

RELATIONSHIP BETWEEN ZONING DISTRICTS AND FLOODLAND REGULATIONS



The above figure illustrates how zoning districts can be used along with special floodland regulations to avoid improper and unwise use of floodlands. Agricultural, conservancy, and park zoning districts are the most common districts which generally permit uses compatible with the flood hazards existing in floodland areas. Floodlands which must be zoned for commercial and industrial uses because of existing or committed development should be so regulated as to permit only parking and open storage in the flood hazard areas and to prohibit the storage of buoyant, flammable, and explosive materials. The use of special floodland regulations in conjunction with regular zoning districts can achieve floodland objectives while obviating the need for special floodway and floodplain districts.

IMPLEMENTION AND FINANCIAL ASSISTANCE FOR FLOOD DAMAGE PREVENTION PROGRAMS

Objective	Device or Action Available	Applicable Unit of Government	Financial Assistance	Reviewing, Cooperating, or Administering Agency
Protection of Existing Development	Flood Control Works	Soil & Water Conservation Districts	Federal Flood Control Funds	U.S. Army District Engineers
			Federal Public Works & Loans	U.S. Economic Development Administration
			Federal Resource Conservation & Development Grants	U.S. Soil Conservation Service
		Flood Control Boards	Federal Multiple-Purpose Watershed Program	
			--	State Department of Natural Resources
	Storm Water Drainage	Utility Districts Drainage Boards Towns, Villages, and Cities Metropolitan Sewerage Commissions	Drainage Improvement Grants	U.S. Army District Engineers
		Town Sanitary Districts	Federal Rural Loans	U. S. Farmers Home Administration
			Federal Sewer Facility Grants	U. S. Department of HUD

FIGURE 6-4 (continued)

Objective	Device or Action Available	Applicable Unit of Government	Financial Assistance	Reviewing, Cooperating, or Administering Agency
Protection of Existing Development	Flood Warnings	U.S. Department of Commerce	Flood Forecasting Program	U.S. Weather Bureau
	Evacuation Measures	U.S. Department of the Army	Emergency Operations Program	U.S. Army District Engineers
Removal of Existing Development	Acquisition for Park Purposes	State	Federal Open-Space Grants	U.S. Department of HUD
			State Outdoor Recreation Aids	State Department of Natural Resources
		Municipalities[a]	Federal Land & Water Conservation Funds	--
			Federal Cropland Adjustment Grants	U.S. Agricultural Stabilization and Conservation Service
	Public Redevelopment	Villages and Cities	Federal Rural Renewal Loans	U.S. Farmers Home Administration
			Federal Urban Renewal Beautification, Insurance, Rehabilitation, & Code Enforcement Programs	U.S. Department Of HUD

FIGURE 6-4 (continued)

Objective	Device or Action Available	Applicable Unit of Government	Financial Assistance	Reviewing, Cooperating, or Administering Agency
Removal of Existing Development	Razing	Municipalities[a]	Federal Demolition Grants	U.S. Department of HUD
	Nonconforming Uses	Municipalities[a]	--	--
	Nuisance Removal	Municipalities[a]	--	--
		State		
Discouragement of New Development	Warning Signs	Municipalities[a]	--	--
	Recordation	Municipalities[a]	Federal Mortgage Financing Insurance	U.S. Federal Housing Administration
	Financing Policies	U.S. Department of HUD		
Regulation of Development	Bulkhead Lines	Municipalities[a]	--	State Department of Natural Resources
	Dam Construction, Operation, and Abandonment	State	--	State Department of Natural Resources
	Exclusive Zoning Districts	Municipalities[a]	--	State Department of Natural Resources
	Floodland Use Regulations	State		

FIGURE 6-4 (continued)

Objective	Device or Action Available	Applicable Unit of Government	Financial Assistance	Reviewing, Cooperating, or Administering Agency
Regulation of Development	Land Division Regulations	Municipalities[a]	--	--
	Building Regulations	Municipalities[a]	--	--
	Sanitary Regulations	County Boards of Health	--	--
		State	--	State Department of Natural Resources

[a] Municipalities include counties, towns, villages, and cities.

Source: SEWRPC, Floodland and Shoreland Development Guide (Waukesha: 1968).

FIGURE 6-5

FLOOD PLAIN REGULATIONS

LOCATION	CHARACTER	PURPOSE AND INTENT	PERMITTED USES
Beloit, Wisconsin	Valley Plain District	Public health, safety, comfort, welfare, reducing financial burdens of community and individuals.	Agriculture/structures, docks, golf, gorestry, nurseries, parks, recreation, preserves, reservations.
Buffalo County, Wisconsin	Flood Plain District		Truck farming, grazing, nurseries, dams/power plants, water measure/control facilities, utilities, golf, recreation, scenic, historic, scientific preservation.
Butter County, Ohio	Flood Plain District F-I		Agriculture/buildings, nurseries, summer houses, trails, seasonal parks, poultry, dairies, stables, community centers, country clubs, golf, docks, sports arenas, signs, equipment storage, treatment/reclamation non-objectionable wastes.
Honolulu, Hawaii	Flood Hazard Districts F-H	Protect life and property, prevent or minimize damage, reduce public cost for flood control, reduce relief efforts.	Recreation, transient amusement, agriculture, parking, loading, unloading, mining, sand/gravel pits, refuse disposal, public facilities, utilities, storage, dwellings for employees on premises (2 ac. min.).

FIGURE 6-5 (continued)

LOCATION	CHARACTER	PURPOSE AND INTENT	PERMITTED USES
Kokomo, Indiana	Flood Plain District	Protect public health, reduce financial burdens on community, its units and individuals.	All AI or RI zone uses except residential; parks, recreation, no structures for residential purpose.
Memphis, Tennessee	Flood Zone Regulations		Any, if premises can be protected by fill or other means.
	Flood District Regulations		Farm buildings; public parks.
Montgomery County, Ohio	Flood Plain District F	Threat to human life and property.	Agriculture, forestry, seasonal homes, parks, recreation, golf, lakes, docks, stables, portable amusement, outdoor shooting ranges, mineral extraction (no shooting).
Riverside County, California	Watercourse, watershed and conservation areas W-I	Public safety and interest, health, comfort and interest, preservation of public peace, morals, order, public welfare.	Field, tree and brush crops, gardening, apiaries, grazing, golf.
Sacramento, California	Flood Zone F	Permits uses for areas subject to inundation.	Agriculture/buildings, docks, restaurant facilities, parks, community centers, recreation/amusement service buildings.

FIGURE 6-5 (continued)

LOCATION	CHARACTER	PURPOSE AND INTENT	PERMITTED USES
San Bernardino County, California	Flood Plain District FP	Prevent economic loss and loss of life and property.	
	Designated Floodway FP-1		Flood control channels, levees, spreading grounds and basins, field crops, grazing, truck gardening, preserves, agriculture.
	Restrictive Zone FP-2		All uses in FP-1; orchards, nurseries, horticulture stock and other agriculture.
Tehama County, California	Primary Flood Plain District-PF	Minimum protection of public health and safety and of property and improvements, from hazards and damage from flood waters.	Crop and tree farming, truck gardening, viticulture, grazing, other agriculture uses, public utility wire and pipe lines for transmission and distribution.
	Secondary Flood Plain District SF	Protect property and their improvements.	Same as PF; residential structures, residential subdivision improvements provided the floor level is above the 1958 flood level.

Source: George Nolte and Associates, Drainage and Flood Control, Background and Policy Study. San Diego, 1970.

FIGURE 6-5 (continued)

CONDITIONAL USES	PROHIBITED USES	STANDARDS	GENERAL PROVISIONS
Single-family if building pad 5 ft. above flood crest, transient amusement, mineral extraction, storage, shotting ranges, riding stables.	Nothing herein shall be construed to prohibit lawful rehabilitation or reclamation of land in Valley Plain District.	Lot size, setbacks, height limits, signs, parking.	Conditional land uses need special permits.
Fill, agriculture/buildings, storage/dumping or buoyant/injurious materials, campsites, any use requiring sewage disposal system.	Residential use; any other not permitted or conditionally permitted.	Lot size, dimension, others as determined by Board of Adjustment.	Permitted uses need zoning permit; conditional uses need special use permit.
Amusement parks, race tracks, inns, drive-in movies, cafes, motels, trails/camps for transient use, airports, shooting ranges, storage/process of junk, refuse treatment, petroleum storage, quarries, gravel pits, municipal garbage disposal.		Setbacks, height limits, lot size.	Conditional land uses need special permits.
	No use or structure permitted that will adversely affect normal flood flow, increase flooding of property above or	Setbacks	A temporary zone--to be lifted when hazard is removed.

FIGURE 6-5 (continued)

CONDITIONAL USES	PROHIBITED USES	STANDARDS	GENERAL PROVISIONS
	below the property, increase erosion, increase peak flow or velocity.		
	All except permitted uses.	None	A temporary zone to be lifted when hazard removed.
	Buildings for permanent residence.	None	
	Any structure for residential purposes other than aforementioned.		All structures need special permits.
Airports, heliports, extractive industry, exploratory, drilling, competitive events, except human.		None	
	Buildings for residential purposes.	None	
Recreation areas, parks, golf, parking lots, athletic fields, fishing lakes.	Fill, excavation, human habitation, storage of floatable substance, no improvement obstructing natural flow to endanger life or property.	None	Conditional uses need special use permit.

FIGURE 6-5 (continued)

CONDITIONAL USES	PROHIBITED USES	STANDARDS	GENERAL PROVISIONS
Excavation, parks/recreation, golf, parking lots, fishing lake, athletic fields.		None	Conditional uses need special use permit.
Agriculture buildings, public utility buildings, parks, recreation, parking, camping, trailer parks, excavation, filling, levees, residences if provided protection and giving no obstruction of flood flow.		None	Use permit required for all conditional uses. All uses must be so constructed and placed to be protected from excess flood damage and offer minimum obstruction to flood flows.
Residences which do not meet floor level requirements but are protected by levees, multi-family, motels, local commercial uses, structures for storage and processing of agriculture products, schools, churches, halls, places of public assembly, libraries.			Use permit required for all conditional uses.

Water Quality Management

The second broad category of water-land interfaces relates largely to developed urban areas, where water supply and wastewater disposal systems already exist, and where water resources in general are highly manipulated and degraded by urban activities. The environmental quality issues here are more in the realm of incremental improvements and extensions rather than preserving ecologic balances or making long-range optimal land-water plans.

The focus of this discussion of the urban or developed water-land interface will be on water quality. Figure 6-6 shows the most basic elements of the water quality management system and some of the issues related to it.

This system which focuses on wastewater and water quality is, of course, part of a larger system which includes solid wastes and air pollution and which has strong relationships with political and socioeconomic systems. The broader systems are beyond the scope of this discussion, but they have been dealt with in the literature.[91]

Problem Definition

In the sections of this study dealing with the urban, or developed, water-land use interface, we will be interested not only in the physical problems related to the interface but also in administrative or management problems. In developed areas where physical systems have already been established to "solve" physical problems, some of the most crucial issues revolve around management of these systems.

The physical problems are basically related to the urbanization trends of the 1960's: great concentrations of population and intensive use of facilities; urban sprawl at the fringe areas; tremendous consumption and conversion of vacant land and small streams; and general degradation of the environment.[92] These problems include:

1. Overloading of facilities--wastewater collection systems and treatment plants (which involve large capital investments) have not kept pace with the great demands placed upon them.

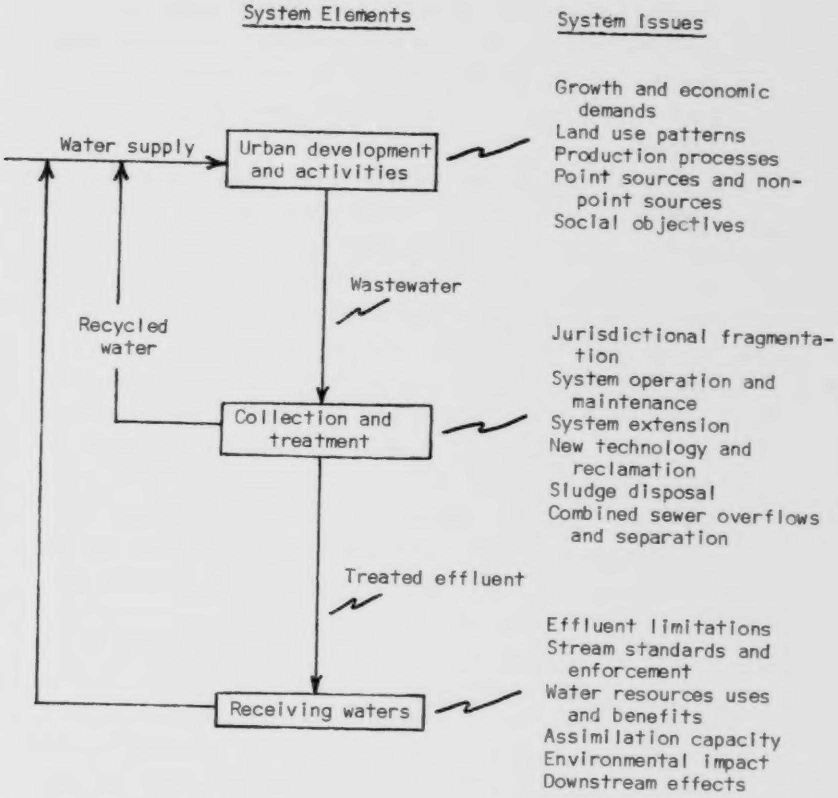

System Elements
System Issues
Water supply
Urban development and activities
Growth and economic demands
Land use patterns
Production processes
Point sources and non-point sources
Social objectives
Wastewater
Recycled water
Collection and treatment
Jurisdictional fragmentation
System operation and maintenance
System extension
New technology and reclamation
Sludge disposal
Combined sewer overflows and separation
Treated effluent
Receiving waters
Effluent limitations
Stream standards and enforcement
Water resources uses and benefits
Assimilation capacity
Environmental impact
Downstream effects

FIGURE 6-6

WATER QUALITY MANAGEMENT SYSTEM

2. Inefficient systems--in many large cities, old sewerage systems, especially combined sanitary and storm water systems, require considerable maintenance, discharge sewage via leaks, and have frequent overflows during storms. In fringe areas, systems serving sprawling suburbs may be inefficient and poorly operated or nonexistent, thus creating septic tank problems.
3. Special pollutants--new industries and technological processes often produce wastes that conventional treatment plants can not handle. Similarly, nutrients and pesticides are generally passed on to receiving waters in spite of treatment processes. Also, the disposal of sludge from treatment plants is an increasing problem as vacant land becomes scarcer.
4. Use conflicts--as urban concentrations and demands increase tremendous conflicts arise over the use of bodies of water for wastewater assimilation, recreation, water supply, power generation, and so on.

Management problems are generally related to the great jurisdictional fragmentation in urban or metropolitan areas and to the persistent engineering-functional bias of municipal water and sewer departments. These problems include:[93]

1. Narrow perspective--most local water quality agencies or departments are single purpose agencies whose primary interest or function is not the general enhancement of water quality. In addition, these agencies have little or no communication or coordination with other municipal agencies (such as the planning department or the building and housing departments), nor do they normally coordinate with water resource departments in nearby cities or counties.
2. Lack of money and expertise--new approaches and long-range planning are almost always overshadowed by daily operation and maintenance.
3. Definition of pollution--even with broad perspectives and plenty of money and expertise, it is very difficult at the urban level

> to determine beneficial uses of water, levels of pollution detrimental to these uses, and workable water quality standards. This is due to conflicting public interests, political constraints, hydrologic uncertainty, lack of data, and, until recently, a lack of interest by federal and state agencies.[94]

Mainstream Management

In this section, "management" will be used to include planning and guidance, since urban water agencies, focusing on the operation and maintenance of existing systems to meet existing demands, are basically management agencies. These agencies are also involved in planning and guidance to some degree, and these activities will be included as special features of management responsibilities.

The mainstream approach to urban water quality management (and urban water resource development in general) is an engineering one in which the overriding objective is provision of efficient physical systems to meet increasing demands.[95] The urban agency involved is usually a single purpose, operation oriented, somewhat autonomous city department or metropolitan special district. This approach has produced great results in terms of quality and dependability of water supply and wastewater disposal services, but has been slow to adapt to changing urban needs, broader social objectives, and new technology or innovative procedures.[96] There are significant reasons for this reluctance to change: the tremendous public investments involved plus overriding concerns for public health and safety make administrators very conservative; existing systems require maintenance to such a degree as to leave few resources for planning or innovation; jurisdictional fragmentation and political uncertainty make comprehensive planning and innovation difficult and risky.

Urban water quality planning became increasingly important during the late 1960's as a result of the federal Water Quality Act of 1965 and subsequent state attempts to formulate water quality standards. Of particular significance is that water quality planning began to slowly change its focus from health objectives and cost-minimization solutions to amenity and ecology objectives and beneficial use solutions. The planning system of the late 1960's consisted of federal guidelines and grants (from HUD and FWPCA, now EPA), state stream standards and enforcement, and local physical development and operation. For several reasons, this planning system was not very effective: there was no strong federal push for action until 1970 with passage of NEPA and recent water quality act amendments and the creation of EPA; states found it difficult to set water quality standards that were realistic; city departments and consulting firms persisted in their bias toward capital intensive construction projects; broader focused planning agencies had no expertise in water resource planning. Metropolitan planning agencies, with some power to review local water resource plans, generally had little basis on which to evaluate the plans or relate them to land use planning.

Urban water quality guidance tools were virtually nonexistent. State water quality standards were only weakly enforced. Local agencies constructed facilities in response to urbanization demands rather than to guide land use development. Surcharges were occasionally applied to industrial wastes, but the charge was usually insignificant or the actual discharges seldom monitored. In general, there was little or no guidance relationship established between water quality management and land use planning and development. In fact, these relationships were rarely envisioned.

A final area of urban water quality management planning involves HUD's "701" planning grants. The "701" program makes grants to local governments for comprehensive planning studies which include water and sewer or utility elements, thus offering an excellent opportunity to relate water resources with land use planning and to guide land development for improved water quality. Such interrelated planning has not generally been the case.[97] Instead, the program has emphasized production of a report rather than establishment of planning processes; relationships between land use and water resources or water quality are largely ignored so that the utility element plans are usually just an inventory of existing systems and a general proposal for meeting new demands; and there is an absence of imaginative or critical thinking as, for example, utility elements are completely subordinate to land use elements and accept and accommodate their proposed development. In effect, the "701" planning program has contributed very little to urban water quality management.

Cutting Edge: EPA Guidelines and A-95 Review

EPA's guidelines for water quality management planning and the A-95 review process are most relevant at the metropolitan or regional level; however, their effect on local water quality management should also be significant.[98] The guidelines, particularly those related to areawide plans, attempt to draw water quality planning and management away from traditional water and sewer service extension plans and bias toward construction of treatment plants. This approach would integrate water quality planning and land use planning (for example control of wastewater quantities through land use location), consider environmental impacts of proposed projects, explore all available alternatives, use technical and intergovernmental advisory committees, and prepare flexible strategies for management rather than a single, rigid plan.

Although this changing emphasis is envisioned at the metropolitan level, the fact that metropolitan agencies have A-95 review powers and added weight under federal and state "environmental impact acts," should begin to broaden local water quality management programs. Local agencies and departments, with their engineering expertise and regulatory powers, are an essential element in water quality management, but they must become more integrated into the broader metropolitan and environmental quality frameworks.

Comprehensive Planning

One of the best examples of a city planning agency attempting to plan for water quality management and relate it to other environmental quality problems as well as to land use plans and controls is the Los Angeles "environmental conservation plan".[99] This study covered air pollution, water quality, noise pollution, conservation of land, solid waste disposal, and pesticides, by defining problems, and by suggesting interrelationships among these problems and land use planning, particularly in terms of possible guidance tools.

The following is a brief summary of some of the problems, relationships, and guidance tools discussed in the study:

1. Water supply--most of the area's water supply comes via open aqueducts, but with the increasing problem of agricultural runoff, including pesticides, there must be more restrictions on the intensity and type of agricultural uses.
2. Sewage disposal--all the cities along the coast dump wastewater in the ocean, which may cause long-range problems. It may be necessary to restrict building permits to prevent system overloading and to encourage wastewater reclamation. The Valley Settling Basin Plant is already reclaiming wastewater for irrigation use. Other possible uses of reclaimed wastewater include industrial cooling and process water, park and golf course watering, groundwater recharge, control of salt water intrusion, and creating and feeding small lakes for recreation.
3. Industrial wastes--planners must work with industries to limit their wastes and adverse effects. This includes location of industries, industrial processes, receiving water assimilation capacities, and much more. The new California Water Quality Control Act (1970) enables regional boards to enforce effluent standards via cease and desist orders and fines. The Porter-Cologne Water Quality Control Act became operative January 1, 1970, and is claimed to be the most comprehensive water quality control law in the nation.
4. Thermal wastewater--Los Angeles has three major steam power plants on the coast, and ecologists are increasingly concerned about the heat effects. One possibility is using the heated water for sea farming.[100]

5. Harbor pollution--the harbor is badly polluted from ships, storm water runoff, and industries with little or no treatment. In late 1969, the Regional Water Quality Control Board directed the city to study the problem, identify the pollutors, and prepare to control the discharges. A big problem is a lack of members on the city and regional control boards and agencies who represent public instead of private interests.
6. Urban runoff--The area has separate storm sewers and many flood control reservoirs, catch basins, and recharge areas so that normal storms and accompanying debris and dirt are not a significant problem. Pesticides and chemicals are a problem and need to be controlled at their source, through street cleaning practices, degradable pesticides, and the like.
7. Inland water recreation--there is great pressure on the Department of Water and Power to open up its reservoirs for recreation because there are few natural lakes in the region. It has been estimated that if the Van Norman Lakes for water supply were opened for recreation, it would cost $250 million for new treatment and pumping facilities.[101]

Comprehensive Management

In 1958, severe sewerage service problems resulting from fragmented local government structure and great public concern for the preservation of Lake Washington led to the creation of the Municipality of Metropolitan Seattle.[102] In 1957, the state legislature enabled formation of multipurpose municipal corporations to provide metropolitan planning and services with a particular eye on solving pollution problems on Lake Washington by diverting sewage discharges from the lake. However, the first attempt to create a multipurpose corporation failed as the small towns in the area feared loss of autonomy. A year later the proposal was reduced to sewage disposal only and passed.

The Municipality of Metropolitan Seattle is comprehensive in that it provides sewerage services (trunk sewers and treatment plants) for an area of 240 square miles which includes thirty-one cities and special districts that used to operate independently. The Metro is able, via its regional scope and adequate financing powers, to make long-range plans and use available scientific expertise to develop strong management alternatives. It is governed by a Council composed of nineteen elected officials from the area (mayors, councilmen, county supervisors), plus a chairman. Thus, it can continue to respond to local government needs.

Innovative Wastewater Treatment

Perhaps the most innovative attempt by local government to control water quality is the wastewater treatment system now being implemented in Muskegon County, Michigan.[103] Its purpose is the elimination of the discharge of wastewater into the county's bodies of water. This is important because the area is highly industrialized and its water resources have become quite degraged. The system consists of six basic components:

1. A collection and transport network--collects wastewater at eleven access points in the existing system and transports it about fifteen miles into an isolated area of the county.
2. Biological treatment cells--wastewater is first put through a three-day biological treatment period to reduce the BOD. Effluent from this treatment is similar to conventional secondary treatment.
3. Storage basins--the effluent is then put in storage basins where the solids settle out and the remaining liquid is kept for irrigation. The basins are quite large and can hold stormwater runoff as well as store the effluent during periods when irrigation is not possible because of frozen ground.
4. Irrigation land and facilities--the effluent from the storage basins is chlorinated and then used to irrigate and fertilize

about 6,000 acres of previously unproductive land. The irrigated land is basically glacial outwash plain which contains very few nutrients and does not hold moisture well.

5. A living filter (the soil)--as the effluent percolates through the aerobic zone of the soil, organic matter is decomposed and nutrients are taken up by plants or the soil itself. Similarly, suspended matter, color, and viruses are removed or decomposed; thus, the soil provides tertiary treatment.
6. Drainage and discharge--after percolating through the soil, the water is collected in a drainage system (wells and drainage ditches) and monitored to check its quality and possibly to adjust the system's operation. After collection, the water is discharged into the area's watercourses.

Most of the elements and concepts involved in this system are not particularly new or revolutionary. For example, land disposal has been used in Europe for at least a century. However, never before in the U. S. have these elements been combined to treat and recycle the wastewater of an entire county consisting of several cities and a population of 170,000. It is beyond the scope of this discussion to detail the events leading to implementation of this system, but it should be noted that it involved a difficult struggle including strong opposition from the State Water Resources Commission, the State Public Health Department, and the City of Muskegon. The basis for this opposition was largely the concern of old-line engineers who favored traditional projects and procedures and questioned the health effects. Through the work of John R. Sheaffer (consultant) and Roderick Dittmer, the county planning director, plus grants from the FWQA, the system was approved.

Controls and Incentives

1. Direct regulation and enforcement--this involves establishment and enforcement of stream quality standards and/or effluent quality standards. These standards do not promote optimal water quality levels since there is no incentive to treat above the minimum, but they are usually justified for safe-

guarding public health. The use of these standards is the most common practice in the U. S. at this time since they are relatively easy to administer.

2. Subsidies--grants or tax incentives to encourage industries or cities to use pollution-control equipment. These subsidies are satisfactory as a short-term measure to help firms avoid undue financial burdens, but are inefficient and negative in the long-term since they encourage firms to continue their present processes rather than search for new ones.
3. Effluent charges--charges are set against effluents on the basis of the cost involved to treat the wastes and the damage the waste would cause to receiving waters. This method is favored by most economists since it tends to minimize waste generation and improve economic efficiency. Effluent charges have not yet been used on a wide scale in this country although their acceptance is rapidly increasing.

Perhaps the best example of local use of effluent charges is the industrial surcharge. Cities or sanitary districts place this charge on industrial effluents that are "excessive" in volume or strength. This tool has been used in isolated cases for years. For example, the city of Greensboro, N. C. has had a surcharge program since 1962 on wastes greater than 300 ppm in BOD or suspended solids.[105] Since EPA has adopted the policy of no more construction grants unless there is a surcharge system, many more cities are now using this tool.[106] For example, the Metropolitan Sanitary District of Greater Chicago, as of December 1970, places a surcharge on effluents greater than 10,000 gpd.[107] The cutoff at this volume level exempts small industries and thus saves administrative costs, however, the program collects about $15 million a year to help finance the District's capital and operating costs. The charges are levied on the basis of the strength of the wastes (BOD and suspended solids), and the industries themselves are responsible for sampling their effluents although the District makes spot checks. The Chicago industries have generally complied with the ordinance and think it is fair. The question remains as to whether the charges are significant enough to encourage industries to improve their production processes in order to reduce their wastes.

Policies

A good example of the formulation of policies related to urban water quality management is the sanitary sewer guide adopted by the Twin Cities Metropolitan Council.[108] This planning guide is particularly significant because the Metropolitan Council has considerable governmental powers and appoints the Metropolitan Sewer Board which designs and constructs the metropolitan sewer system. Some of the policies are as follows:

1. Prohibit discharge of sewage effluent into all lakes in metropolitan area.
2. Coordinate planning, design, construction, and operation of all treatment works to form a single system.
3. Provide an automatic river and effluent monitoring system.
4. Allow septic tanks only on very large lots that have good hydrologic and soil conditions.
5. Provide metropolitan sewer service first to areas subject to public health hazards and second to areas indicated by metropolitan policies of orderly growth.
6. Prohibit service extension into areas where development should not occur such as flood plains, airport zones, groundwater recharge areas, and areas designated for open space use.
7. Locate and design treatment works to be functionally and aesthetically compatible with adjacent development and the environment in general.

Public and Private Action

It is often the case that public agencies do not act quickly or effectively without strong citizen action groups and public opinion movements to stimulate them. In the Chicago metropolitan area, at least two citizen action groups, Businessmen for the Public Interest and

Citizens Action Program, have been instrumental in water quality management actions. The BPI, through its professional legal capability, has stressed court and administrative actions. Two of its most important court litigations involved thermal pollution from nuclear power plants on Lake Michigan and the "rubber stamp" use of the Refuse Act permit program. In the case of thermal pollution, the power company agreed to install cooling towers (Palisades plant), and EPA became actively involved in the Lake Michigan Enforcement Conference pushing for a uniform thermal standard for the lake.

The Citizens Action Program is more local in nature and emphasizes direct community political action. This group waged war against the Stickney wastewater treatment plant operated by the Metropolitan Sanitary District of Greater Chicago. This plant was one of the largest sludge burning operations in the world and thus a major cause of air pollution. CAP was instrumental in establishing the industrial waste surcharge ordinance discussed earlier and in implementing an innovative sludge disposal system. The Sanitary District now keeps some of its sludge in a semiliquid form and ships it by railroad tank cars to farm lands in southern Illinois.[109] This was originally done as an experiment on a 155-acre farm near Arcola by the Soil Enrichment Materials Corporation, the same firm that engineered the Muskegon project. Since the success of sludge as a fertilizer has been established, it is now being used in various areas of the state to revive land ravaged by strip mining, to fertilize an area previously sterilized by a glass factory, and to cover a sand land fill area at Northwestern University.

Storm Water Drainage

Much of what has been said about water quality management, in terms of problems, single-purpose management agencies, and guidance tools is also true of storm water drainage. However, the storm water subsystem has been the most isolated of all water subsystems.[110] Storm water has generally been regarded simply as a nuisance and a purely negative good to be disposed of as quickly as possible. While water supply, water use, and wastewater disposal systems have been interrelated to some extent, storm water systems (except for combined sewer systems) are usually quite independent. The basic elements and some significant relationships of the storm water system are shown in Figure 6-7.[111]

As an area becomes urbanized, the runoff flows over imperious surfaces and is collected in storm sewer systems. Thus, natural channels and small streams begin to disappear, and there is less infiltration to the groundwater table. An interesting example of this phenomenon is the Rock Creek watershed in Maryland, just north of Washington, D. C., where of the 103 kilometers of flowing streams in the watershed in 1913, only 42 percent still existed in 1966.[112]

Although this is an example of a changing spatial distribution of water, it is more importantly accompanied by a changing time distribution. When storm water is diverted from the natural drainage system (including infiltration) to the manmade sewer system, the peak flows increase significantly and their duration periods and lag times decrease. The emphasis of this section will be on time distribution problems and related water quality problems.

Problem Definition

The basic problems related to storm water drainage have to do with the stochastic nature of the flows and the quality of the runoff. Both of these problems are, of course, related to the nature of the urban area.

The three general areas of storm water drainage problems are:[113]

1. Greater peak flows--the larger the percentage of impervious surfaces and the percentage of the area served by storm sewers, the greater the peak flows will be and the quicker they will occur. This leads to problems of overflowing and flooding in the urban area since the sewers cannot be realistically designed to handle all storms.[114]
2. Greater total runoff--total runoff is largely a function of the land cover and its infiltration characteristics. In urban areas there will be greater total runoff leading not only to greater peak flows and local flooding, but

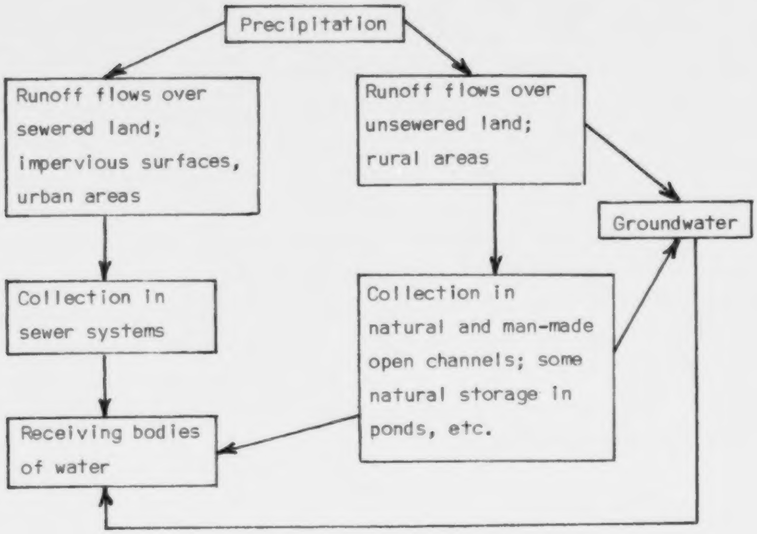

Precipitation
Runoff flows over sewered land; impervious surfaces, urban areas
Runoff flows over unsewered land; rural areas
Groundwater
Collection in sewer systems
Collection in natural and man-made open channels; some natural storage in ponds, etc.
Receiving bodies of water

FIGURE 6-7
STORM WATER MANAGEMENT SYSTEM

also increased downstream flows and flood hazards as more water is passed on from the urban area.

3. Water quality--given the large impervious urban areas such as streets and parking lots and the existence of dirt, debris and chemicals on them, the quality of urban runoff can be very poor. This source of pollution, which is termed the non-point source, has been largely neglected until recently, but is an important area for water quality management.[115] Also, in areas where combined sanitary and storm sewers exist there may be severe problems of sewer overflows during storms resulting in the discharge of raw sewage.[116]

Mainstream Management

Since the overriding purpose of most storm water drainage systems is fast removal and disposal of storm water runoff, management (planning, construction, and operation) of these systems has been seen as an engineering problem and has been divorced from other urban systems and activities. In addition, the removal of storm water has always been perceived as a local problem, and as such, the systems themselves are fragmented and uncoordinated.

Managing institutions are generally city departments of public works or special drainage districts. These agencies either have their own engineering expertise or use consulting engineers to design the systems. The most common design practice is to simply use the "rational method" to determine the maximum rate or flow of storm water runoff and size the sewers accordingly.[117] Although this method of design is based on years of experience and empirical studies, it has several limitations.[118] One limitation is that the "rational method" only gives the maximum flow, Q, and thus is useful only for sizing the sewers. The method does not consider the timing of the flow (the complete hydrograph) or the quality of the flow, and therefore arbitrarily eliminates the possibility of designing systems that include detention, storage, and treatment facilities. In addition, the method tends to overdesign the system since it does not use sophisticated economic analyses, for example, damage functions, but rather relies on engineering "safety factors."

Underlying the limitations of current practices in storm drainage design is the lack of data on urban storm water runoff, particularly in terms of quality. As of 1969, only a few sewered catchments had been gaged, and these records were only for a few years.[119] There is an almost complete absence of urban runoff models, economic analysis functions and models, and environmental impact relationships. However, recently the American Society of Civil Engineers has undertaken a major urban water resources research program which emphasizes urban hydrology.

Cutting Edge: Combined Sewer Alternatives

One of the most serious problems in urban water quality management is that of combined sewer overflows during storms. This problem does not affect all cities as most newer cities have separate sanitary and storm sewer systems. However, many of the larger, older cities have extensive combined sewer systems with numerous overflow points. For example, Chicago has over 400 points of overflow into two local watercourses; Boston has over ninety points of overflow despite a sixty-year policy of sewer separation, and Detroit has 124 points of overflow making it the largest source of pollution for Lake Erie.[120] The most common or "mainstream" attempts to control this problem have been separation of existing combined sewer systems and policies that all new sewer systems must be separate. Separation of existing combined systems has proved to be a gigantic task that is now being recognized as unrealistic. For example, it is estimated that it would cost over $2 billion to separate the systems in Chicago or Detroit and take over forty years to do it.[121]

The more innovative engineering approaches to the problem of combined sewer overflows generally involve some form of auxiliary storage to handle the large but infrequent storm water flows. One of these approaches uses the ambient storage capacity of existing trunk sewers by manipulating constrictions or gates within the sewer system to take advantage of underused sewers. Since rainfall can have a wide range of areal and temporal variability, some sewer mains in a large system may be overloaded while others may be almost empty. By regulating flows within the system, it can be used much more efficiently to handle storm water flows and reduce overflows. This basic approach is being used in the Twin Cities, Detroit, and Seattle.[122]

A second approach is the use of new storage located at elevations below the normal sewer system. This approach uses deep tunnels and vaults to store overflows until they can be treated; it also uses reversible pumps to incorporate features of pumped-storage power generation. Plans for this approach were pioneered in Chicago by the Metropolitan Sanitary District.[123] Because of the tremendous scope and costs involved in the plan, a more modest "underflow plan" is now recommended by the Chicago area Flood Control Coordinating Committee.[124] This plan emphasizes the conveyance tunnel features of the original plan rather than the huge underground storage elements although a 2.5 mile reservoir is still proposed that would store overflows for up to fifty days. This plan is likely to be implemented in some form as the city has already begun limited construction of some tunnel interceptors in place of conventional sewers.

A third approach combines features of the first two and is more comprehensive though still engineering-oriented. A plan for San Francisco includes a new combined flow treatment plant, a number of detention reservoirs located below streets in upstream areas, a number of shoreline detention reservoirs, a deep cross-system storage and transmission tunnel, and a fully automatic operational control system.[125] All three approaches require some degree of automatic control because of the stochastic nature of the use of the system. The development of such control capability is still in its early stages.[126]

Land Use Alternatives

One of the basic problems in the design and use of storm sewers is that of proper size, or carrying capacity. The system will be idle and underused most of the time if it is too large; but there will be occasional damaging overflows if it is too small. In any case, it is not feasible to design the system to handle the largest of storm water flows. One innovative approach to this dilemma is the "dual drainage system," which combines a normal drainage system to handle minor storms with a second drainage system, consisting of natural drainageways, impoundments, and even the streets themselves, to handle major storms.[127] The second or "overflow system" would be closely related to land use planning and guidance and to the design and layout of streets. It would use floodway and floodplain regulations to protect natural drainageways; it would encourage blue-green development so that storm water could be impounded and detained on-site; and it would design street patterns and grades to facilitate the storage and routing of storm water overflows. The second system is a "natural" but well planned contingency system for overflows from the conventional sewer system.

The Denver Regional Council of Governments is leading the way in adopting the dual drainage system concept as a fundamental drainage philosophy.[128] Several of Denver's major land use projects incorporate this dual system philosophy:[129]

1. Leetsdal-Oneida apartment complex--the development consists of 390 dwelling units on fourteen acres. In between the apartment buildings are several landscaped detention ponds which can retain the entire runoff from a two-year storm and 85 percent of a 100-year storm; these ponds are used for aesthetic and recreational purposes and, in addition, one of the ponds is used for groundwater recharge. Also, the roofs of the buildings are designed to hold three inches of water and release it at a controlled rate.
2. Harvard Gulch flood control project--this project was implemented in a flood prone section of Denver with the objectives of not interrupting existing development but also adding to the aesthetics and recreational opportunities of the area. The project consists of a greenbelt approach in the residential areas, resulting in twenty-six acres of park land adjacent to the floodway; enclosing the channel in commercial areas to prevent flood damage; and some storm water flow is stored and used for irrigation of the greenbelt.
3. Skyline urban renewal project--the Denver Urban Renewal

> Authority voted to require rooftop ponding in an eighty-acre renewal area in downtown Denver. The requirements call for three-inch ponding on building rooftops and three-quarter-inch ponding on elevated plazas and pedestrian malls, allowing the storm sewer system to be designed for a ten-year storm yet handle a 100-year storm. In addition, the on-site ponding reduces flood peaks in the South Platte River.

The Chicago metropolitan region, due to the efforts of the Northeastern Illinois Planning Commission and the Metropolitan Sanitary District, is another area with several examples of innovative storm water management:[130]

1. Flick-Reedy plant--an industry locating in a flood plain area solved several problems by excavating three on-site ponds and using the dirt to raise the building site area; thus, the building was above flood level and the ponds were used to store storm water to reduce downstream flood peaks. Some of the storm water runoff from the roof and parking lots was used for industrial water supply.
2. Marcy Forest View apartments--an example of an alternative to permanent ponds. This apartment complex uses depressed tennis courts as temporary detention ponds during storms; runoff collects in the depressed area and is discharged later along with water from a "housekeeping" hosing down of the court to clean it.
3. Indian Lakes subdivision--this new subdivision included an eight-acre lake to collect and detain storm water from the subdivision; the lake also increased the value of the adjacent lots and the subdivision in general.

Urban Waterfronts

The interface between the city and the bodies of water that flow through or are adjacent to it is one of the most comprehensive of the water-land interfaces.[131] Almost all cities are located near a significant body of water or stream and derive much of their existence from it. The water is used for navigation, water supply, power, and waste disposal. In particular, industries locate on the waterfronts for transportation and cheap water supply and waste disposal. Most urban waterfronts are dominated by industries, ports and related facilities, railroads, and highways. In addition, given the early location of these bulk uses on the waterfront, other less amenable uses, such as dumps, are also located there. In general, urban waterfronts and bodies of water have been exploited as tools of production and have been forgotten as areas of natural processes and great beauty.

Problem Definition

Perhaps the most significant underlying factor in the problems of the waterfront is the long history of public apathy toward it.[132] Until very recently, the public has generally viewed the urban waterfront as a resource to be exploited by private interests and has been unaware of the possible alternative uses, largely because much of the waterfront has always been inaccessible to the public and therefore of little concern to them. There are of course some significant exceptions, such as Chicago and Washington, D. C., where many miles of the waterfront are devoted to parks, marinas, and scenic drives.

Waterfront problems can be broken down into three basic categories:

1. Deterioration--large areas of urban waterfronts are presently going through a period of decay and deterioration, partly because much of the development is old, but more importantly many of the traditional waterfront uses (industries) are moving away from the waterfront to urban fringe areas, while other uses, such as railroad yards and ports, are becoming much less important. Similarly, adjacent commercial areas are deteriorating.
2. Competition--there is a key conflict between the traditional uses of the urban waterfront and the emerging amenity uses such as open space and recreation. For example, transportation

uses block access to the water, and industrial uses create water, air, and noise pollution reducing amenity values. Even where land is available for amenity uses, the full potential is not often realized because of land use conflicts.

3. Fragmentation--again, a significant problem is the fragmentation of jurisdictions and agencies related to the waterfront. In particular, most functional agencies involved in waterfront activities, such as port authorities or water and sewer agencies, are concerned only with their specific function and are insensitive to broad social benefits or compatibility relationships. Planning agencies and citizens groups can exert some advisory influence but are generally powerless to acquire land or control development in waterfront areas. A good example of the planning versus implementation conflict is in the Boston metropolitan area where the Metropolitan Area Planning Council has done an innovative study of the harbor and its islands for recreational development, but the key implementing agencies in the area, the Metropolitan District Commission (water and sewer) and the Boston Redevelopment Authority, are not particularly interested.[133] In addition, various federal agencies, such as the Corps or railroad regulatory agencies, tend to impede local waterfront redevelopment.[134]

Mainstream Management

Comprehensive planning and guidance in waterfront areas is virtually nonexistent,[135] because of the great fragmentation of agencies with special purposes and interests that control much of the waterfront. It is also due to the status quo inertia of large industrial and railroad-warehouse areas. For example, general land use plans prepared by planning agencies usually just show existing industrial waterfront areas to continue as such, and local governments encourage this in hope of greater tax revenues. Most local planning and development has either remained at the planning stage or resulted in small projects, such as marinas, or in commercial and industrial redevelopments oriented largely to the upper and middle classes. Conventional local guidance tools such as zoning and subdivision ordinances are usually either ineffective or not applicable while direct acquisition is usually infeasible.

Federal development, or "improvement," of waterfronts, such as channel improvements, port facilities, and interstate highways, is generally unquestioningly accepted by local governments, regardless of local needs, because of the grants or subsidies involved. However, some federal programs offer a great opportunity to redevelop urban waterfront areas in a comprehensive and innovative manner--the federal urban renewal and model cities programs. Unfortunately, these programs have not been applied to waterfront areas except in a few cases and then primarily for special purposes--for historic site preservation in Sacramento and Seattle.

Cutting Edge: Comprehensive Planning

One of the more comprehensive waterfront planning studies was done for the northern waterfront in San Francisco.[136] The study covered land use, transportation, open space and recreation, urban design, special subareas such as Fisherman's Wharf, and special problem areas such as ship terminals and storm water overflows. Implementation of the plan was to rely on public investment and development which would lead to responsible private development within certain zoning controls. The Northern Waterfront Plan, as adapted from the Bolles study, was adopted by the San Francisco Planning Commission in 1969.[137]

The plan's primary objective is maintenance and development of the waterfront area to highlight and complement its unique maritime character not only to serve local residents but also to attract and accommodate tourists. Some key planning and guidance policies from the plan include:[138]

1. Transportation--discouragement of any new freeways through the area; new high capacity roads should be underground if possible; encouragement of rapid transit access to the area, especially to the Fisherman's Wharf subarea. The local circulation system should intercept as much traffic as possible before reaching the shoreline. Major off-street

parking areas should be provided on the area's periphery in order to facilitate pedestrian activity within the area. The ferry system and terminal should be revived as a major transportation alternative; wherever feasible railroad tracks and yards should be relocated to the Southern Waterfront (south of the Bay Bridge). Cable car lines should be extended in the area and a minirail system be considered to complement them.

2. Industry--all non-port industries should be eliminated over time. As these industries leave, they should be replaced by open space or housing.
3. Commerce--encourage water oriented retail, restaurant, and commercial recreation activities. Office space and hotels can be developed in the Fisherman's Wharf area.
4. Residence--encourage mixed land uses as a positive characteristic of the waterfront. Try to attract residential uses to the area, especially for lower income groups and the elderly.
5. Recreation--encourage provision of more urban plazas, pedestrian walkways, and street greenways. A marine park with walkway linkages to existing parks should be developed; noncommercial recreation areas should have high priority in obtaining vacated industrial or railroad sites. Public viewing access to the water and shipping activities should be increased--through construction of overlooks.
6. Urban design--maintain the form of the waterfront by restricting building height. Viewing corridors should be preserved or created which link the city and the bay. In major pedestrian areas, entertainment and shopping facilities should be kept at ground level. Any development beyond the sea wall on piers should be closely regulated, especially to require public access and view of the water. The historical architectural quality of the waterfront should be preserved.

Although the waterfront study and plan addressed some water quality and ecologic issues, for example, combined sewer overflows and filling in the Bay, they are predominantly concerned with land use, transportation, and design of the waterfront. The San Francisco case is comprehensive in terms of land use planning for the waterfront, but perhaps somewhat lacking in terms of the total water-land interface. Of course, this broader interface is more in the realm of regional agencies, such as the San Francisco Bay Conservation and Development Commission, and was discussed earlier under "Estuaries and Wetlands."

Two Planning Approaches

Planning studies in two major midwestern cities offer an interesting contrast in management approaches to riverfront areas. In Minneapolis, a study being conducted for the Mississippi River waterfront concentrates on urban design, while in Milwaukee the study of the downtown reach of the Milwaukee River was quite technical and oriented toward water quality.[139] One reason for this contrast is that the Milwaukee River waterfront is intensely urban and somewhat deteriorating with very poor water quality while the Mississippi riverfront in Minneapolis is much more scenic, includes a waterfall, has several different urban districts (like the University of Minnesota campus), and is partly undeveloped in many areas. Both approaches are significant for their management of waterfront areas.

The Minneapolis study pointed out the importance of immediate action since the national government is interested in environmental quality, several local railroads are planning to merge and vacate riverfront land, the University is expanding, and several redevelopment projects are in progress. The study stressed the importance of goal formulation based on individual and community values. The goals set forth in the study are oriented toward the design of buildings and land uses to maximize the aesthetic and amenity potential of the waterfront. The interim plan is intended to be imaginative and suggestive to promote community interest. District discussions are accompanied by numerous sketches aimed at initiating this imaginative interest in the future of the riverfront.

The Milwaukee River study was done at the request of the Mayor of Milwaukee and was directed by a technical committee of officials from city departments. The purpose of the study was documentation of the decay of the riverfront and stimulation of citizen commitment to solving the problems. It was also to appraise the future potential of the riverfront but on a "realistic, practical, achieveable basis." The main body of the report dealt with water quality, flood control, river structures (such as docks and bridges), dumping ordinances, stream encroachment, dockline ordinances, and building setbacks. The study is somewhat short on imagination because of its writers' overriding concern with facing all the realities. One important recommendation was creation of a Milwaukee River Coordinator's office to implement a riverfront master plan. It was felt this would be accepted by public and legislative bodies yet would be able to effectively use existing controls and plans. Some of the plan's implementation measures are:

1. Master plan for the river
2. Zoning to control uses and bring order
3. Urban renewal and redevelopment in deteriorating areas
4. Demolition
5. Reclamation and refurbishing of buildings worth saving
6. Building setbacks
7. Architectural controls
8. Control of signs and billboards
9. Public Acquisitions
10. Civic center planning
11. Cultural installations
12. Litter control

Controls

One of the best examples of imaginative and successful waterfront management is the beautification of the San Antonio River in downtown San Antonio.[140] The city has adopted an ordinance to promote and preserve the natural beauty and recreational aspects of a three-mile stretch of the river, particularly in the heart of the downtown district. The ordinance provides essentially for architectural controls, appearance, materials, signs, lighting, and so on, for the area adjacent to the river. It also created a River Walk Commission, appointed by the city council, to review all plans for development in the riverfront area.[141] Special permits are required in order to construct or alter buildings. The result is a beautiful "commercial-leisure area" of scenic walkways, landscaped areas, limestone bridges, cafes, antique shops, and a river bank theater.

It should be noted that this is a somewhat limited example. The "river" is, in fact, only a very small stream fed by wells and air-conditioner water discharges; it starts in a nearby park and thus is narrow as it passes through the downtown area. The stream was originally fed by springs but has never had any significant water supply or drainage functions, so there was no problem of industrial use. Also, outside of the Paseo Del Rio section, there has been no special consideration given to the waterfront usage of the city's other rivers and streams.

Action Program

The Spokane riverfront program[142] is a good example of coordinated planning and development in a riverfront area. The development program covers a fifteen-mile stretch of the Spokane River which includes, in the heart of the city, a series of cascading rapids and spectacular waterfalls. Despite its natural beauty, the riverfront was largely industry oriented and contained railyards for three major railroad lines.

In 1966, the City Council approved a budget to prepare a riverfront plan, and, in 1967, the Spokane Riverfront Development Program was officially approved. Approval of the program and its great success since then has been due to tremendous citizen and business interest and cooperation. In particular, the business community has backed the program to the extent that it has arranged for Spokane to be the site of the 1974 World Exposition on man and his environment. Preparation of Exposition facilities is a key element in the waterfront program.

A significant aspect of the program is its emphasis on action. The strategy has been one of outlining the riverfront plan, and then proceeding to acquire land and redevelop areas while the final plan was being formulated. For example, although the final plan is just now being completed, planners and businessmen had been meeting with the railroads for several years, and in 1969, the railroads agreed to move their yards and donate the land to the city for parks and cultural centers. These railyards are presently being moved, and the land will be temporarily used for the Exposition. Other examples include:

1. 500 acres of forest land downstream from the city has been acquired and added to an existing state park;
2. a primary sewage treatment plant is to be changed to advanced treatment by 1974;
3. a tributary creek is to be dammed for water recreation and about 170 acres of land have already been acquired;
4. the city has acquired considerable tracts of land to be rezoned for planned unit developments;
5. private developers are already constructing apartment complexes along the river under planned unit development restrictions;
6. the city has acquired land for a proposed marine park; and
7. in the central area, the railroads have donated land and are moving their yards, HUD funds have been acquired to develop much of the land, the state has pledged money for an auditorium, and the federal government is planning a $12 million pavillion.

Metropolitan Integration

Up to this point we have been discussing water resource planning and guidance within a problem oriented framework that made a distinction between developing urban regions and already developed cities. On the one hand, we looked at urbanizing watersheds, shorelands, estuarine regions, and floodplains, while on the other, we considered urban water quality systems, drainage systems, and waterfronts. This developing-developed distinction, of course, is not always clearcut and many problems and solutions overlap the two categories. The primary interface between the two is at the metropolitan level, that is, the level which includes not only all of the local jurisdictions and systems but also the urban fringe and linkages to regional systems. This section attempts to integrate the developed and the developing water-land interfaces via the "metropolitan perspective."

The whole realm of metropolitan water resource problems and management is beyond the scope of this paper and has been well-documented;[143] however, the general nature of the metropolitan situation can be outlined. In the first place, it is widely acknowledged that local government, particularly in complex metropolitan areas, is not doing a good job of providing water resource services. For example, the Chicago metropolitan area has 349 separate water supply systems and 134 wastewater disposal systems. The problems involved have been discussed in previous sections and can be summarized as:[144]

1. excessive fragmentation in government and service agencies;
2. inadequate controls at the regional or areawide level;
3. widespread ignorance or underestimation of ecological problems and planning issues; and
4. insufficient funds and expertise.

Cutting across these problems in the metropolitan area are two key issues, whether or not we need areawide water resource management and/or integrated water resource management.[145] Areawide management involves unifying the management of a single water resource function, water supply, for example, over an entire metropolitan area. Integrated management involves unifying the management of two or more water resource functions for at least one jurisdiction but possibly over a wider area also. The areawide management issue can be outlined:

1. Advantages include possible scale economies from consolidating facilities and eliminating overlapping activities; more comprehensive and effective management of flood plains, water quality, and groundwater; and elimination of many institutional coordination problems.
2. Disadvantages include loss of local identity and control; separation of the service function from other local functions

and land use controls; and the fact that scale economies are site-specific and may not always accrue in every case. Another factor is that large water supply and wastewater disposal systems may divert excessive volumes of water from local streams thus seriously diminishing their flow.

The integrated management issue:

1. Arguments for integrated management center on the close relationships among various water resource functions--wastewater treatment and reclamation are closely related to water supply and recreational use of water bodies, while storm water drainage affects water quality, and land use planning is closely related to flood plain management, extension of utilities, and reservoir site preservation. Central, or coordinated, planning and management of all functions is necessary for better use of water resource.
2. Again, local governments and agencies tend to resist integration movements. About one-half of U. S. cities over 10,000 population have integrated management of water distribution and wastewater collection systems, but this management does not always include treatment plants and only one-fourth of these cases include storm water drainage systems.[146] The key to functional integration is not joint operation of systems but rather coordinated planning. Total systems integration is not necessary if planning and decision-making can be coordinated by some other means, for example, a strong metropolitan planning agency with expertise in water resources such as the Southeastern Wisconsin Regional Planning Commission.

Integrated areawide management:

1. The ideal approach from a systems point of view would be the combination of jurisdictional consolidation and functional integration.[147] This would lead to a much broader perspective for management of water resources and encourage innovation and ecologic awareness.

2. Such a total systems approach would require a wide range of expertise, not only at planning levels but also at operating levels, and complex information systems. The present lack of both expertise and data severely limit this approach.

In relation to these coordination and integration issues at the metropolitan level, the efforts of Gilbert White and John Sheaffer have produced six criteria for delineating and evaluating metropolitan water resource management.[148] These criteria are seen as representing the emerging concept of metropolitan water resource management, since they represent a consensus among water resource researchers and managers as to the direction of future urban water management. The six criteria are:

1. Multiple purpose planning--metropolitan water resource management should be based on the multiple objectives and needs of the area.
2. Multiple means--a wide range of alternatives should be considered to satisfy these objectives and needs.
3. Public and private coordination--both public and private interests and groups should be incorporated into the management process at both the planning and implementation levels.
4. Research--research should be consistently conducted and used to formulate new management opportunities and to demonstrate new techniques.
5. Comprehensive planning--metropolitan water resource management should be one integral element of the total metropolitan planning and development process.
6. Regional integration--there should be some feasible means of coordinating all metropolitan jurisdictions and functions. This criterion, in effect, includes all other criteria and is both the most important criterion and the most difficult one to satisfy. Actual delineation of the criterion is still in a conceptual stage, but it involves use of strategies of flexible management related to metro-

politan decision-making processes, coordinated planning activities, and integrated guidance tools.

The rest of this section will be devoted to some examples of metropolitan water resource management. The examples are selected on the basis of the above criteria but generally do not conform to very many of them. Each example will be particularly related to one of the criteria.

Cutting Edge: Multiple Purpose Planning

Multiple purpose water resource planning and development at a river basin or regional scale is not new. The TVA and the Corps of Engineers have been involved in multiple purpose development since the 1930's.[149] Most major reservoirs today provide a wide range of benefits such as flood control, water supply, recreation, low-flow augmentation, and hydroelectric power generation or cooling water for fuel plant power generation. At the metropolitan and local levels multiple purpose management is not common. As discussed earlier, the reason for this is the persistence of local, single-purpose water resource agencies. Some metropolitan and local planning agencies, such as the Los Angeles Department of City Planning, the Northeastern Illinois Planning Commission, and the Metropolitan Council of the Twin Cities, recognize the need for small-scale, local, multiple purpose projects and management. A few examples which are becoming more common are:

1. use of floodplains for open space, recreation, and groundwater recharge;
2. use of small impoundments for storm water detention, recreation, aesthetics, water supply;
3. use and redevelopment of waterfronts and riverfronts for recreation, aesthetics and imagery, and as a focus for a mixed variety of land uses; and
4. use of wastewater for reclamation purposes such as irrigation, cooling water, and recreation and wildlife lakes.

Multiple Means

One of the best examples of a planning agency attempting to meet all the criteria is the Northeastern Illinois Planning Commission. The principal output of the Commission, a water management report, was a significant attempt at defining and employing the regional integration strategy.[150] However, since the NIPC is only an advisory agency and this new approach conflicted with conventional state water resource programs, the report was not widely accepted. Yet, many of its recommendations have been implemented or at least acknowledged as useful by local governments and agencies in Northeastern Illinois.

In particular, one of the strong points of the report was a comprehensive and illustrative treatment of alternative means or measures for managing water resources. This included not only a description of various structural and non-structural measures but also a discussion of the legal status of the measures and the present and proposed government agencies for implementation. See figures 6-8 and 6-9 for a summary of these discussions.

In addition, the final chapter of the report outlined some key elements of the regional integration strategy and then presented some fairly detailed examples of how the strategy would work in terms of specific means for management. A short description of these prototype means or plans includes:

1. Private control of urban runoff--development of industrial and apartment complex sites to detain storm water runoff, provide water supply or groundwater recharge, and add recreation and aesthetic benefits.
2. Industrial redevelopment--redevelopment of the Chicago stockyard area via excavating sand in the area as a mineral resource and using the pits as groundwater lakes for water supply, open space, storm water detention, groundwater recharge, and combined sewer overflows.
3. Small watershed management--alleviation of flooding, pollution, and recreation problems via a coordinated program of wells for low-flow augmentation, artificial

FIGURE 6-8

WATER RESOURCE MANAGEMENT MEASURES

Measures	Water Problems Reduced	Prerequisites	Current Application
I. Interbasin transfer A. Tunnels B. Open channel C. Pipelines	Flooding; low flow; water supply needs; recreation needs	Basins with surplus water	Chicago Sanitary Canal System Chicago Water Supply System
II. Storage of surface runoff			
A. Preservation of natural storage	Flooding; preserve natural recharge	Open space in flood plains	Forest preserve flood plains, stream channels
B. Downstream storage	flooding	Downstream space and channel capacity	Salt Creek, Weller Creek, and St. Joseph Creek Improvements
C. Artificial storage	Flooding; low flow; water supply needs; recreation needs	Sites for storage	Skokie Lagoons, on Skokie River, Fox Chain O'Lakes
III. Ground-water Management			
A. Withdrawal	Water supply needs; low flow	Unused water, Collection of hydrologic and geologic data	Shallow aquifers (locally) Cambrian-Ordovician aquifer
1. Development of maximum sustained yield			
2. Withdrawal from storage			
B. Replenishment	Water supply needs; low flow	Prime recharge areas	Forest Preserve flood plains
1. Natural recharge preservation	flow; flooding	Open space	
2. Artificial recharge		Surplus water, Storage space Suitable geologic and hydrologic conditions	None

IV.	Conjunctive use of surface and subsurface reservoirs	Flooding; low flow; recreation needs	Surplus water, surface and subsurface storage space, artificial recharge and pumping facilities	None
V.	Water quality management			
	A. Pollution source control	Pollution; recreation needs; water supply needs	Treatment plants	Widespread for a few pollutants, none for others
	B. Transport of pollutants	pollution, recreation needs	Transport water	Widespread use of streams to transport wastes
	C. Accommodate pollutants	Pollution	Safe geologic environments	
VI.	Water-use management			
	A. Increase use efficiency	Water supply needs, transport	Ordinances, information	During emergency situations
	B. Use transfer	Water needs, pollution		
	C. Increase reuse			
	D. Match use with supply			

Source: NIPC

Management measures	Administrative unit	Legal basis	Limitation
Reduce underground leakage	Public water supplier	Police power	Reasonableness
Require industries to conserve water	Water supplier	Police power	Reasonableness
Require water conserving plumbing fixtures	Building or plumbing codes of local governments	Police power	Reasonableness
Regulate lawn sprinkling and air conditioners	Public water supplier	Police power	Reasonableness
Universal metering	Public water supplier	Police power	Reasonableness
Regulate land use to be compatible with resource pattern	Unresolved	Unresolved	Unresolved
Require use of non-drinking water	Public water	Police power	Reasonableness

Source: Professor Arthur M. Scheller, Jr., DePaul University College of Law, on file at the Northeastern Illinois Planning Commission.

FIGURE 6-9

LEGAL BASIS AND ADMINISTRATIVE AGENCY FOR SELECTED WATER USE MANAGEMENT MEASURES recharge of groundwater from above normal stream flows, multipurpose impoundments, and flood plain regulations related to land use plans.

4. Urban redevelopment--clearance of a low-density blighted area of shacks and polluted surface ditches and the excavation of a groundwater, multiple purpose lake for recreation, storm water detention, low-flow augmentation, and as a site for a planned unit development or a junior college.
5. Metropolitan management--the areawide use and coordination of multiple purpose reservoirs, groundwater recharge, flood plain regulations, advanced treatment, low-flow augmentation, and inter-watershed diversions of storm water.

Public and Private Coordination

A key element in the regional integration strategy is coordination of public and private agencies in the planning and management process. This is an extremely difficult task given the great number of agencies, groups, and interests involved and the channels of communication required. One attempt at establishing a framework for communication, and perhaps coordination, is the work of the County of Santa Clara Planning Department in compiling an environmental information directory.[151] The purpose of the directory is to facilitate communication among all the citizen organizations and governmental agencies involved in environmental considerations. In addition, the directory provides a guide to sources of information and agencies responsible for specific environmental decisions and actions.

The first part of the directory separates environmental concerns into some thirty specific issues and under each issue lists all the private organizations and local, regional, state, and federal agencies active in that area. A second part of the directory outlines functions and powers of local governments and agencies, such as intergovernmental policy and planning committees, and lists local environmental issues and related regulations with specific references for detailed information. This section is significant in that it can facilitate the meaningful involvement of citizen groups in planning and action programs by providing authoritative information on which agencies are responsible for specific environmental problems and the general scope of their powers. For example, this section contains information on zoning ordinances, land development regulations, grading and filling regulations, and land use planning principles.

The third part of the directory contains detailed descriptions of the purpose and powers of several regional agencies. These include the Association of Bay Area Governments (ABAG), the Bay Area Sewage Services Agency (BASSA), the Bay Conservation and Development Commission (BCDC), and the California Regional Water Quality Control Board - San Francisco Region. These descriptions are extremely informative and are useful in defining the procedural framework within which local agencies and private groups and interests can operate.

The final sections of the directory are much shorter and are intended to outline the broader institutional perspective. They cover state government, federal government, and environmental law in general.

Research

One of the best examples of a metropolitan planning agency responding to new research and concepts and attempting to incorporate the results into its planning process is the Regional Plan Association in New York City. As part of its formulation of the Second Regional Plan, the Association along with the Metropolitan Regional Council (composed of local elected officials) sponsored a comprehensive waste management study.[153] The primary purpose of the study was to determine if the New York metropolitan area could continue to grow and still handle its wastes. Growth projections and alternative development patterns were analyzed in terms of their effect on waste production and management.

However, this was no ordinary solid waste or water pollution study because the consulting authors were not only experts in specific areas of environmental pollution, but also were leaders in the formulation of more comprehensive and systems oriented approaches to environmental management. In particular, Blair Bower, from Resources for the Future, introduced concepts and techniques for analysis from what is now known as the residuals management framework.[153] Some important areas of concern in the study are:

1. The assimilative capacity of the environment--"pollution" occurs only when the discharge of wastes significantly impairs the use of air, water, or land; the effect of the discharged waste is a function of many factors other than the quantity and type of the waste itself, for example, occurrence and reaction with other wastes, atmospheric and hydrologic conditions.
2. Interrelationships among forms of wastes--one form of waste may be transformed into another form during disposal; for instance, incineration changes solid wastes into gaseous wastes. If controls are used to deal with one form of pollution, a second form may result.
3. Regional planning and waste management--spatial arrangement of urban development is a key factor in the environmental effect of waste discharges. Spatial arrangement is also important to the efficiency of waste collection and disposal.
4. Controls on waste discharges--the basic types of controls are raw material or production input standards, discharge standards and effluent charges, and ambient standards.
5. Strategies for improving environmental quality--reduce waste generation by changing production processes and its inputs and outputs; reduce wastes after generation by reclamation or treatment; increase assimilative capacity by redistributing the discharges and spatial arrangement of waste sources and affected receivers.

Comprehensive Planning

One of the most important criteria for metropolitan water resource management and a key aspect of attempts at regional integration is the need for a close relationship between water resource planning and overall metropolitan planning. Water resource planning must be one integral element of comprehensive metropolitan planning. Although this criterion has seldom been met in the past, new EPA guidelines are beginning to require such integration.[154] These guidelines, specifically for water quality management, require, in addition to the traditional basin plan, an areawide or metropolitan plan. The metropolitan plan must be consistent with the comprehensive development and land use plans for the area and generally be framed to be compatible with local institutions, programs, and environmental situations.

The EPA guidelines are intended to increase the importance of metropolitan water resource planning done by comprehensive metropolitan planning agencies.[155] This planning would not only attempt to meet water quality standards and explore available technology and alternatives as is traditionally done, but it would also add a broader perspective to the process and emphasize relationships to land use and land use planning; non-point sources of pollution (urban runoff); local environmental impacts (specific local problems and needs at micro scales); technical, intergovernmental, and citizen advisory committees; review of local projects to conform with metropolitan plans and policies (A-95 review); and an overall management strategy to include institutional relationships and guidance tools such as federal-state standards, state permit programs, zoning ordinances, and sanitary regulations.

Very briefly, the water quality management plan for a metropolitan area consists of the following elements:[156]

1. Water quality analysis--existing standards, water quality, uses, assimilation capacities, and problems; future probable and achievable water quality levels;
2. Wastewater source analysis--municipal and industrial discharges; non-point sources;

3. Existing facilities analysis--municipal facilities; institutional programs and controls; septic tank use;
4. Social, economic, and land use analysis--present and projected population, economic base, land use, and land use plans and controls;
5. Planning criteria--cost-effectiveness criteria; environmental impact criteria (soil suitability, geology, groundwater); federal, state, and local requirements and programs;
6. Political and administrative analysis--existing service areas, agencies, programs, and regulatory powers;
7. Resource capability analysis--federal and state grants; local charges and revenues; implementation schedule;
8. Alternatives analysis--treatment levels, reclamation and reuse, land use control; tradeoff and optimization models;
9. Water quality management strategy--alternatives, controls, schedules, institutions, priorities, impacts, contingencies, and the like.

The actual preparation of metropolitan water quality management, or water resource, plans and the integration of this planning process into overall metropolitan planning and decision-making processes are hampered by severe constraints. Among these are the general lack of water resource expertise in metropolitan planning agencies, the long tradition of local, operation-oriented, single-purpose water resource departments, and the lack of federal grants for planning. In particular, the lack of water resource expertise is a significant factor as shown in the following examples.

One means to integrate water resource planning into comprehensive planning is for the comprehensive planning agency to do an in-house study. An example of this is the environmental element of the general plan for Los Angeles.[157] Water resource problems and policies are closely related to other environmental problems (air quality, solid waste disposal, land conservation) and to land use planning; this effort is certainly a good illustration of comprehensive planning. However, the environmental element is framed at a very general, policy oriented level so that it is likely to have limited effect on any action agencies (water resource departments) or guidance tools. Without precise data and analysis such planning may have little meaning for implementation.

A second approach is for the planning agency to use consulting firms to provide the expertise and prepare detailed, engineering oriented reports. This approach is often used; an example is the regional utilities study for the Hartford metropolitan area.[158] This study was comprehensive in that it covered several environmental functions and related them to the needs and conditions of the metropolitan area. It was also action oriented in that it prepared detailed analyses and plans and proposed specific management measures and organizations. There is always doubt whether this report, or any consultant report, will really become part of the planning framework. It is likely that much of the analysis and many of the recommendations will be made quite independent from the on-going metropolitan planning process. Without staff expertise in these areas it is difficult to interpret the report and integrate it into the planning process.

Regional Integration

This cutting edge is partly a combination of all the other criteria discussed here. This section emphasizes coordination of metropolitan jurisdictions and responsibilities. One of the most interesting examples of potential coordination for metropolitan water resource management is in the Philadelphia area. In addition to the usual complex of cities, counties, and special districts or authorities, the area includes two states, Pennsylvania and New Jersey, and two significant planning agencies, the Delaware Valley Regional Planning Commission and the Delaware River Basin Commission. In a framework water management plan the DVRPC outlined the basic roles or responsibilities of these jurisdictions and agencies:[159]

1. Delaware River Basin Commission will plan the overall macro-development of the water resources in the river basin; establish principles, policies, and standards for development within the basin; and review all projects having a significant effect on the water resources in the basin.

2. Delaware Valley Regional Planning Commission will prepare a metropolitan water management plan within the framework established by the DRBC; provide metropolitan projections and land use plans as a basis for the water management plan and for the DRBC's river basin planning; review and coordinate local projects to assure consistency with metropolitan and basin plans and to qualify for federal grants.
3. States will adopt drinking water and water quality standards; encourage regional and metropolitan planning approaches; and review projects in relation to water quality standards, especially for public health objectives.
4. Counties will work with the DVRPC in providing projections and land use plans and will help coordinate local water management agencies and departments.
5. Local agencies and departments, with DVRPC assistance will provide water resource services as well as plan these services and facilities within the framework established by the DRBC and on the basis of DVRPC projections and land use plans.

Another example of a complex jurisdictional situation is the Washington, D. C., metropolitan area. In this case a special study conducted by the Environmental Protection Agency proposed a specific organizational structure to deal with water resource management and environmental planning.[160]

1. Interstate compact would create a Regional Council for comprehensive planning and decision-making and an Environmental Service Corporation for provision of water resource services.
2. The Regional Council would be elected by the people of the region and replace the present Council of Governments. It would perform all the planning functions now done by the COG and would adopt a comprehensive development guide to control all water management programs in the region. Development guide policies could eventually be expanded to control other service programs.

3. The Environmental Service Corporation would be established by the Regional Council and function under its supervision. It would cover the entire region and provide wholesale facilities for water supply and waste management. It would acquire and/or construct and operate these facilities, which would include water supply reservoirs, water and wastewater treatment plants, regional water mains and trunk sewers, incinerators, sanitary landfills, and solid waste transfer stations.

Footnotes

1. Peter Raven-Hansen, *Water and the Cities: Contemporary Water Resource and Related-Land Planning* (Cambridge: Abt. Associates, Inc., 1969).

2. See Blair Bower, "Residuals and Environmental Management," *The Journal of the American Institute of Planners*, Vol. 37, No. 4 (July 1971).

3. Several such frameworks were developed in National Academy of Sciences, National Research Council, *Waste Management and Control* (Washington, D. C.: 1966).

4. David Heeter, *Toward a More Effective Land-Use Guidance System: A Summary and Analysis of Five Major Reports.* PAS Report No. 250 (Chicago: American Society of Planning Officials, Sept.-Oct., 1969).

5. Arthur Maass, Maynard Hufschmidt, et al., *Design of Water Resource Systems* (Cambridge: Harvard University Press, 1962).

6. For a specific adaption of the model to water quality planning with emphasis on economic relationships see Allen Kneese and Blair Bower, *Managing Water Quality: Economics, Technology, Institutions* (Baltimore: John Hopkins, 1968).

7. Environmental Protection Agency, *Guidelines: Water Quality Management Planning* (Washington, D. C.: 1971).

8. See M. B. McPherson, *Prospects for Metropolitan Water Management* (Cambridge: ASCE, Urban Water Resources Research Program, 1971); and Water Resources Engineers Inc., "Appendix H," in William Ackermann, et al., *Systematic Study and Development of Long-Range Programs of Urban Water Resources Research* (Cambridge: ASCE, 1968).

9. See Robert Anthony, *Planning and Control Systems: A Framework for Analysis* (Cambridge: Harvard Press, 1965) for a discussion of activities involved in strategic planning, management control, and technical control.

10. For details on the urban water quality management process of the 1960's see Feter Raven-Hansen, *Water and the Cities: Contemporary Urban Water Resource and Related-Land Planning* (Cambridge: Abt. Associates Inc., 1969).

11. Edward Kaiser, "Planning Urban Development Guidance Systems for Local Government," Paper presented at Confer-In-West, Annual Meeting of the American Institute of Planners, San Francisco, October 1971.

12. Maynard Hufschmidt and Karl Elfers, Water Resource Planning in the Urban-Metropolitan Context (Chapel Hill: University of North Carolina, 1971); Guy Kelnhofer, Jr., Metropolitan Planning and River Basin Planning: Some Interrelationships (Atlanta: Georgia Institute of Technology, 1968); Gilbert White, Strategies of American Water Management (Ann Arbor: University of Michigan Press, 1969) Chapter VI.

13. John Shaeffer and Arthur Zeizel, The Water Resource in Northeastern Illinois: Planning Its Use (Chicago: NIPC, 1966).

14. For a complete discussion of socio-economic systems cutting across hydrologic systems see John W. Dyckman, "Beyond the River Basin in Water Resource Planning," ASCE Water Resources Conference, Denver, May 17, 1966.

15. Governor's Patuxent River Watershed Advisory Committee, The Patuxent River (Baltimore: Maryland State Planning Department, 1968).

16. See for example Luna Leopold, Hydrology for Urban Land Planning--A Guidebook on the Hydrologic Effects of Urban Land Use, Geological Survey Circular #554 (Washington, D. C.: USGS, 1968) and M. B. McPherson, Hydrologic Effects of Urbanization in the United States (New York: ASCE, 1972).

17. This is especially true when a city or regional agency wants to impound a unique stream for water supply or flood control. See the case of the Eno River in Maynard Hufschmidt, Water Resource Planning in the Urban Metropolitan Context (Chapel Hill: University of North Carolina, 1971), Chapter 5.

18. See Public Law 566 (83rd Congress) and U. S. Department of Agriculture, S.C.S., Watershed Protection Handbook Notice I-17 (Washington, D. C., 1971).

19. See any "water and sewer report" for an urban area. For example, W. M. Piatt and Company, Wastewater Collection and Treatment, Forsyth Couty, North Carolina (Winston-Salem: 1971).

20. Southeastern Wisconsin Regional Planning Commission, A Comprehensive Plan for the Root River Watershed (Waukesha: 1966); Southeastern Wisconsin Regional Planning Commission, A Comprehensive Plan for the Fox River Watershed (Waukesha: 1970); Southeastern Wisconsin Regional Planning Commission, A Comprehensive Plan for the Milwaukee River Watershed (Waukesha: 1972).

21. See Ian McHarg, *Design with Nature* (Philadelphia: Falcon Press, 1969).

22. See Ian McHarg and Michael Clarke, "Skippack Watershed and the Evansburg Project," Chapter XVI in Charles Goldman, ed., *Environmental Quality and Water Development* (Arlington: National Water Commission, 1971).

23. Bucks County Planning Commission, *Natural Resource Plan, Phase I* (Doylestown: 1971).

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25. Southeastern Wisconsin Regional Planning Commission, *Floodland and Shoreland Development Guide* (Waukesha: 1969).

26. See Ian McHarg, *Design with Nature* (Garden City: Coubleday, 1969), for several sets of ecologic rules for development.

27. Paul D. Marr, "Environmental Councils and Planning Commissions - Emerging Relationships in Local and Regional Government," paper presented at the AIP Confer-In 1972, Boston, Oct. 7-11, 1972.

28. For an example in the Susquehanna River Basin see Spenser Havlick, "The Construction of Trust: An Experiment in Expanding Democratic Processes in Water Resource Planning," *Water Spectrum*, Vol. 1, No. 2 (Summer 1969).

29. Donald Woolfe and Robert Grunwald, "Explorations in Intergovernmental Activity in the Environmental Planning Process," paper presented at AIP Confer-In 1972, Boston, Oct. 7-11, 1972.

30. Interview with Lane Kendig, Bucks County Planning Commission. Also, see Bucks County Planning Commission, *Natural Resources Plan, Phase I* (Doylestown: 1971).

31. For details see John Keene and Ann Louise Strong, "The Brandywine Plan," *JAIP*, Vol. 36, No. 1, January 1970.

32. See Harold Guy, "Control of Sediment in the Urban Environment," in Maurice Albertson, et al. (eds.) *Treaties on Urban Water Systems* (Fort Collins: Colorado State University, 1971).

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CHAPTER 7

URBAN DESIGN: MANAGING THE VISUAL QUALITY OF THE URBAN ENVIRONMENT

Page

Major Changes in Urban Design 282
  - Changes in Contextual Factors 282
  - Changes in End-State Approach 285
  - Changes in Design Methods and Techniques 289
  - Comprehensive Integration 291

At the Cutting Edge in Urban Design 291
  - Urban Renewal: The Major Focus of Project-Oriented Urban Design 292
  - Joint Concept Strategy: A New Approach to Project Design 295
  - The Process Approach to Achieving Visual Quality 298
  - Implementing Urban Design Objectives Within the Process Approach 308
  - Innovative Guidance Techniques 314

Historic Preservation 321
  - Contextual Changes in Historic Preservation 322
  - Innovative Approaches at the Local Level 326
  - Additional Innovative Local Tools 330

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CHAPTER 7

URBAN DESIGN:
MANAGING THE VISUAL QUALITY OF THE URBAN ENVIRONMENT

Urban design refers to the broad range of local governmental activities that seek to enhance or preserve the visual and amenity quality of the urban physical environment. These include conventional design and construction of building projects, development of policies, principles and criteria to guide the design efforts of others, use of legal controls and design review programs, and preservation of environmental elements and districts having historic or cultural value.

Until recently, environmental quality has been an implicit goal at the core of most design activities dealing with environments for human habitation. "Design is, in the final analysis, the conscious search for quality through form."[1] Environmental quality, as used by designers, sometimes embraces a broader meaning, referring generally to the "Quality of Life." Those espousing this orientation hold that the only meaningful measure of environmental quality is the quality of life which the environment fosters and supports, and that man is the central focus and measure of environmental quality. In the main, however, design tended to concentrate on the physical and environmental, rather than the human, dimensions, assuming that the manipulation of this dimension was directly linked to the quality of social, economic, and cultural factors. This set of assumptions, known as physical-determinism, played a significant role in the design of urban form in spite of an inadequate understanding of the relationships.

Until the late 1960's, environmental quality objectives tended to be expressed in terms of esthetics or visual quality and amenity. As late as 1968, Hoppenfeld, in calling for a change in urban design, charged: "The design professions have tended to concentrate almost exclusively on the esthetics of environment, making the main issue one of form and

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excitement..."[2] Other dimensions of environmental quality (for example, ecological values and pollution) received little attention in most design activities. However, during the late 1960's with societal recognition of environmental problems and the development of new planning methodologies which recognized broader environmental quality objectives, urban designers began to take a closer look at the environmental quality dimensions of their work.

Major Changes in Urban Design

Urban design activities have modified in response to recent urban issues, problems, and opportunities. There have been three major innovations. First, there have been contextual changes in the role of urban design vis a vis its private-public function and changes in the definition and the role of the urban design client. Second, reflecting these new roles, there has emerged a new and broadened emphasis on a process approach to urban design. Third, new methods and techniques have been developed to increase the effectiveness of urban design activities. While these three can be identified individually, a fourth major area of change is the manner in which individual changes have been integrated into more systematic and comprehensive urban design programs.

Changes in Contextual Factors

Two variations in the context of urban design significantly altered its practice. The first was a shift in emphasis on design quality from a private to a public good. The second has been a redefinition of the client and his role in the design process. The first provided urban design with new opportunities while the second has called into question the urban designer's role and forced a change in the traditional designer-client relationship--a keystone of professional practice.

The concern of much of urban design has been with providing environments which meet all of the user's needs. It has attempted to design environments which were not only functional, efficient, and economic, but also beautiful, exciting, and interesting as perceived by designers.

Perhaps because other professional groups (engineers, economists, and city planners) were also concerned with the more basic needs, urban designers tended to emphasize the "higher order" needs of beauty and amenity and claim them as their exclusive expertise.[3] Historically, these qualities were provided to the upper classes by the private sector. However, in the 60's there was a growing belief that these needs should be promoted by government for the public as a whole. In both Kennedy's "New Frontier" and Johnson's "Great Society," this was a pervasive theme.

At the same time the concept of esthetics, defined as the formal or syntactic qualities of the environment, was enlarged to embrace the behavioral and cognitive, or semantic, dimensions of the perceived environment. Premised on the philosophical concepts of Santayana and Arnheim, and rationalized by the theoretical and empirical works of designers and social scientists such as Gibson, Hall, Lynch, Rapaport and Sommer, the broader concept of visual quality replaced esthetic quality. This expanded concept, while including the formal esthetic qualities of the environment, also included the meanings the environment held for its users and the implications form had for psychosocial behavior and well-being.

Concurrently, the courts expanded their interpretation of the general welfare concept of the police power to include happiness, enjoyment, and mental health. This action opened up the possibility of using zoning and other regulatory measures to promote a wide range of esthetic and amenity objectives.

A difficulty in increasing public influence to achieve these objectives revolved around the problem of defining esthetics. The inability to do so to the court's satisfaction resulted in public efforts being concentrated in three areas where agreement could be reached. The first such area was with respect to physical elements regarded as amenities. Amenities commonly referred to such elements as benches, landscaping, fountains, and lighting. The natural environment provided a second area of agreement. There was an explicit consensus that nature is inherently beautiful. President Johnson expressed this in his 1965 address to Congress. He said, "Certainly no one would hazard a national definition of beauty. But we do know that nature is nearly always beautiful."[4] The final area of agreement was in the matter of historic preservation. Historic buildings and areas were generally assumed to have esthetic value. While such assumptions were necessary and useful, the fundamental issue of defining esthetics persisted.

Because governmental provision of higher order needs for the public as a whole required an explicit consideration of those needs and values, the traditional designer-client relationship began to disintegrate. It is in this relationship that a second contextual change occurred.

In most urban design work in public programs, governmental agencies represented the public and acted as a surrogate for it. The authoritarian practices of such agencies and their failure to adequately represent user interests together with the designer's reliance on his own values and responses greatly influenced the demand for citizen participation. From renewal to model cities, guidelines were established requiring active public participation in the design process. The public's participatory role conflicted with the traditional elitist orientation of most urban design practice. Even where explicit attempts were made to institutionalize a participatory design process, the tendency to deal with what Herbert Hyman terms "the power elite"[5] was prevalent.

Designers have relied primarily on subjective knowledge and unsystematic methodologies in developing their proposals and plans. In this context underlying assumptions and decision roles are personal, implicit, and often obscure. Demands for participation meant that these underlying principles, assumptions, and decision rules would have to be exposed. The reluctance to adopt a more explicit, systematic, and objective methodology was based on two factors. The first was the belief that creative processes must be subjective, personal, covert, and any attempt to analyze, systematize, or objectify the design process would destroy the elements essential for creativity. The second factor was that intuitive methods supported the designer in his role of esthetic expert. By keeping the assumptions and decision rules implicit and institutionalizing the esthetician role, designs were difficult to fault along esthetic dimensions. Without new methods and orientations, a meaningful interaction between designers and citizens' groups was difficult.

The latter half of the 60's saw the emergence of a number of community design centers and advocacy design groups. These young design groups attempted to establish a new designer-client relationship involving direct interaction with citizen groups. Their efforts, while worthwhile in their own right, were outside the institutional context where most major decisions are made and often resulted in being more obstructive than positive. There is current evidence, however, that these groups are beginning to develop operational philosophies and techniques which increase their effectiveness in dealing with both clients and more institutionalized design groups.[6]

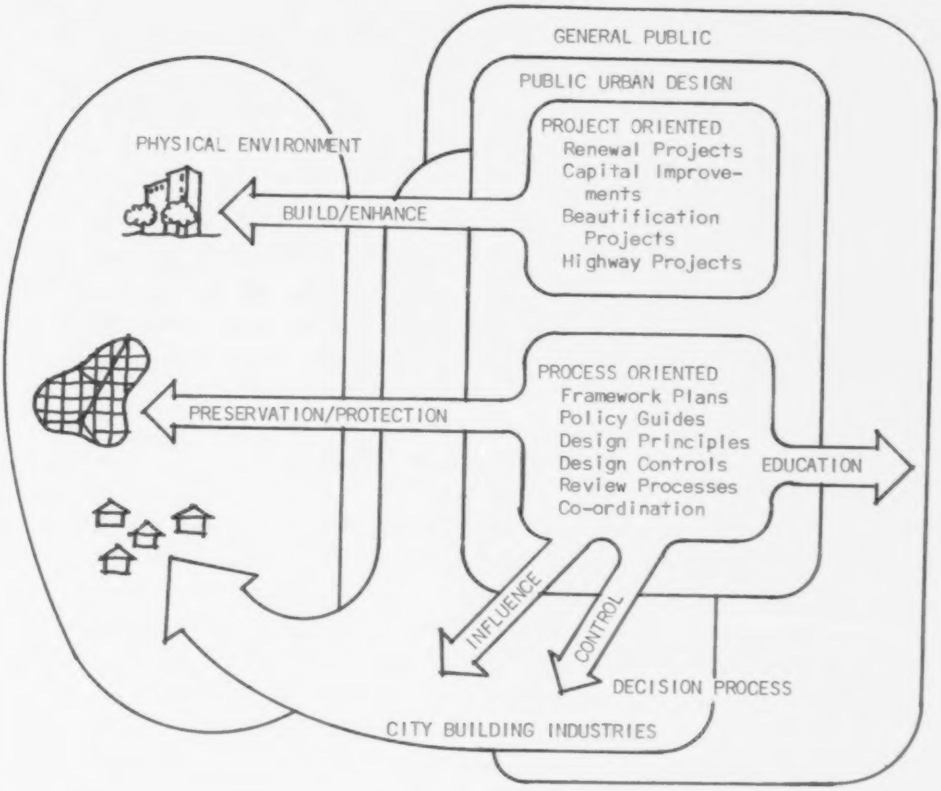
Changes in the End-State Approach

Urban design activities can be characterized as consisting of two basic approaches. On the one extreme is the project approach where a physical setting is conceptualized, a design in the form of plans, models, and specifications is developed for that concept, and the physical elements are made to conform to the model and concept. At the other extreme is the process approach in which the specific form of the physical environment is not a central issue. Again, a physical setting is conceptualized, then policies and guidelines are developed to guide design activities so that a specified level of environmental quality, rather than a specific form, is achieved.

The project approach directly influences the environment. (See Figure 7-1.) In most cases the specified product is built into the environment as a total package (large-scale renewal projects and civic centers). Sometimes, existing environments are enhanced through beautification programs which normally concentrate on environmental elements such as street lighting and landscaping. In other cases, such as design district plans, it is not intended that the plan will be realized through construction. These plans are produced to stimulate the private sector by providing "creative design" ideas. Thus project oriented activities influence the environment in three ways: (1) building new large-scale improvements; (2) enhancing existing environments; and (3) attempting to influence the private sector with heuristic ideas.

FIGURE 7-1

URBAN DESIGN ACTIVITIES AND THEIR INFLUENCES ON VISUAL QUALITY



The process approach affects the environment in a less direct manner. (See Figure 7-1.) It recognizes that the bulk of city building activities takes place within the private sector, so to influence environmental quality one must influence private development. This is done in several ways. First, the process approach acts through design framework plans, regulatory devices, design review, and other coordination programs: These actions intervene in the decision process, attempting to guide and coordinate private development decisions. Second, implementation of projects, renewal programs, open space programs, and the like, that are designed within the objectives and criteria of the process framework, alters the urban context for private development. Such actions set a standard for future development and a justification for the policy framework and regulations. Finally, the process orientation affects implementation of environmental quality by educating the general public.

Because of urban design's early ties with architecture and landscape architecture, attempts to improve the quality of the urban environment tended to be project oriented. Designers were trained to think in terms of building projects. Large-scale municipal improvement projects, such as civic centers, governmental complexes, and recreational centers are classic examples. Later, under federal urban renewal programs, these improvements were conducted by local government, in some cases assisted by the private sector (Charles Center, Baltimore; and the Golden Triangle, Pittsburgh). Although urban renewal projects came to depend increasingly on process type tools for implementation, they were viewed and conceived as projects and depended mainly on the techniques and methods of that approach.

In this context the project approach was fairly appropriate. However, urban designers learned that such plans frequently failed to achieve their counterparts in reality. It was accepted as a "...truism that city plans do not get built."[7] Cities frequently did not have the funds to implement them; the private sector had neither the financial resources or the power of land acquisition or control. As concern developed for the visual quality of entire cities, the project approach manifested additional limitations. Urban design in this context had to respond to a different set of conditions. The urban environment is dynamic; changes result from conscious decisions of a myriad of actors, each seeking his own goals. The ability of the public to control private sector activities is limited. With this limitation, the boundary between public concern and private rights becomes crucial. The time span and distance from the action is considerably different. Given these factors, designers realized that public goals could not be achieved by executing building designs, but required techniques for controlling the building activities of the private sector.

Aspects of the process approach have been a part of planning activities since before the recognition of urban design as a professional activity. Setbacks, height limits, sign ordinances and architectural control programs, existing from the 30's, are explicit manifestations of this approach and have been used to achieve visual objectives. These and other techniques were employed together with projects in design programs. Thus, urban design carried out within the comprehensive planning context took on a more process oriented approach,[8] often resembling a guidance system.

Urban design's emphasis also changed with respect to the levels of the environment with which it was concerned. Until recently, most urban design activities did not deal with the entire city but focused on districts within it. Urban renewal projects, CBD plans, entranceway studies, and appearance controls, are typical examples. Aside from the limited capacity to deal conceptually, economically, and even jurisdictionally with these problems at a citywide level, much of the justification for a district focus flowed from the assumption that certain districts can be identified as having significant value to the urban area as a whole, thereby justifying public action. Some districts were seen as having major economic significance (CBD's and some waterfront areas), while some districts were seen as having cultural and/or environmental value (waterfronts, historic areas, open space areas). The public supported action at this level, and often there existed a large government investment in areas that could be used as a lever to influence private development.

Of late there has been a trend away from the district level focus toward a citywide concern. Initially, Lynch's studies of imageability and visual order stimulated the citywide concerns. Later, the need and desire to develop an overall framework within which to coordinate private development and public urban design led to studies at the city-wide level. In addition to analyzing problems and proposing solutions at the broader level, most framework studies concluded by identifying design districts which meet some criteria for special treatment (San Francisco Urban Design Plan and Design Framework for Minneapolis). These design districts may be areas where environmental conditions are poor, indicating a rehabilitation or renewal policy, or they may be areas where environmental conditions are good, indicating a preservation strategy. Citywide studies have been used to identify boundaries between areas which have different characteristics, are valued differently by users (or designers), and require different design policies and/or approaches.

Public design activities have always focused on individual building components that contribute to visual quality, for example, street lighting and furniture, fountains, signs, and trees. In larger cities, programs dealing with these elements often existed as part of district programs--"Streets and Plazas for Washington, D. C.," Cincinnati "Street Hardware Study," and the Boston "City Signs and Lights Study." However, in some cases, particularly in smaller cities, programs have dealt almost exclusively with these elements, concentrating on amenities and beautification, practicing what has been called cosmetology rather than design.

Public urban design is increasing at all levels. The present trend is greater emphasis on the citywide level with systematic exploration of interrelationships among levels before detailed work is carried out at each level.

Changes in Design Methods and Techniques

Major changes have occurred in the ways urban designers analyze and solve their problems. These methodological changes have influenced the quality of project and process approaches. These design methodologies may be viewed as a continuum with subjective or intuitive methods at one end and objective methods at the other. Any one design activity may vary along the continuum between the extremes. For example, a particular design activity may be generally characterized as primarily subjective even though certain aspects of the activity may be carried out in an objective manner.

Subjective methods use implicit decision rules and assumptions not based on scientific evidence. They rely on personal experience, emotions, and intuition, and they do not use available data. This orientation is closely associated with the fine arts and traditional design practices. In part, its acceptance and use is tied to assumptions concerning the nature of the creative process and to the maintenance of the designer's role as the esthetic expert. By contrast, objective methodologies use available data and rely on scientific evidence and quantitative techniques as well as explicit goals, decision rules, and criteria.

Urban design activities have been shifting along the continuum toward more objective methods, as is exemplified in current programs in Minneapolis, San Francisco, Dallas, and Seattle.[9] However, judgment, subjectivity, and intuition still play a major role in the methodologies used in the field. The creative requirements of the product and the complexity of the phenomenon preclude developing completely objective methods. A balance of objective and subjective methodologies, referred to as systematic methodology, is required. The systematic orientation recognizes the advantages and disadvantages of each approach and attempts to use each where appropriate and to integrate them effectively. At present the major characteristics of the more systematic approaches to urban design methods are: (1) greater explicitness of goals, objectives, decision rules, principles, and criteria; (2) more scientifically premised and comprehensive data; (3) scientific procedures for gathering, coding, and analyzing data; (4) systematic feedback and redesign; and (5) careful integration of creative and analytic phases. This shift partially resulted from the increased demand for public participation. Another major factor was a lack of acceptance of design solutions by decisionmakers, the courts, and the public at large, particularly with respect to visual quality aspects. Since environmental quality could not be defended objectively, it often lost out to more objective factors and economic ends.

Objectivity was further encouraged by an increasing need to rely on police power for implementation. Given the nature of esthetics, courts and legislators were reluctant to expand regulatory limits. The mere systemtization of esthetic values made them more palatable, and even impressive, to decisionmakers.

Comprehensive Integration

Active municipal design programs seldom use only one end-state approach or focus on only one discrete level of the environment. Rather, cities tend to select specific approaches and techniques and apply them to appropriate problems at the particular level of the environment where they will be effective. This generally results in the development of an urban design guidance system, which is applied to all levels of the environment. For example, some recent urban design studies, primarily in large cities, begin with a process approach, developing an overall citywide framework with specific objectives, principles, and criteria. This framework is then used to develop policies, capital improvement programs, district regulations, and review procedures (process technique) as well as to develop design plans and capital improvement projects (project technique) at the district level. Within this context, specific capital improvement projects, regulations, incentives, and educational programs are devised to influence the environment at the element level.

On the one hand, the particular significance of these new approaches lies in emphasis on (1) process orientation at all levels as a means of coordinating design efforts; (2) a citywide framework for lower level applications; and (3) systematic use and integration of all implementation forms. On the other, the importance of these approaches lies in use of more systematic methods and techniques of analysis, concept generation and evaluation.

At the Cutting Edge in Urban Design

We now turn to a more detailed discussion of the major thrusts of the model presented in Figure 7-1: *Urban Design Activities and Their Influences* on Visual Quality. The first is a discussion of the innovations currently emerging in project design. The second is a discussion of the cutting edge of the process oriented approach to urban design. The third section will discuss innovative implementation measures employed in the process approach. It will detail the interface between urban design studies and the various actors in urban building industries. The fourth section covers historic preservation activities which are just beginning to be integrated into urban design programs.

Urban Renewal: The Major Focus of Project Oriented Urban Design

Urban design programs have been most successful where there is significant opportunity for large-scale redevelopment. These opportunities are created by federal housing and urban renewal programs. Thus, earlier and more vigorous urban design programs have relied on a project approach. Providence's College Hill, Boston's Government Center, Philadelphia's Society Hill, Pittsburgh's Golden Triangle, Baltimore's Charles Center, and Cincinnati's CBD redevelopment are a few of the more significant projects carried out using this basic approach.

Many urban redevelopment efforts, particularly those initiated under federal programs, were not classic examples of the project approach. While conceived as projects, many found it necessary to employ process approach techniques to implement their programs. The distinction, however, in viewing them as project-type approaches is due to the essentially project nature of the approach to the problem and the general bias toward the project orientation.

As renewal opportunities diminish, mostly because of changing federal priorities, this approach will have to change. However, urban design continues to look to agencies such as the Boston Renewal Authority and the Department of Urban Development in Cincinnati, where there are still renewal opportunity and strong urban design programs. It is important to examine both the opportunities and the limitations created by close ties with governmentally sponsored urban renewal programs.

The primary advantage of implementing urban design objectives under governmentally sponsored renewal is that the program is designed to remove some of the major constraints to the project approach. Through eminent domain, land parcels can be assembled, of sufficient size to ameliorate any negative externalities that might reduce redevelopment potential. Through writedowns, land can be made marketable. These factors create a favorable context for development and a desirable place to invest capital.

The desirability of the area is further increased by large-scale capital improvements made by local government. This has three benefits: it sets up a physical context for private development and provides environmental amenities which increase the financial attractiveness of the area; it offers the opportunity to influence private developers to accept design specifications; and well-designed public works, by example, encourage a higher quality of private development.

With the land in public ownership, normal legal constraints are eliminated. Conditions on use and standards for design and development can be specified creating a development policy framework, which is implemented through requirements specified in the disposition contract and through design review procedures which insure that these agreements are carried out. Directly linking policies to implementation creates a design situation similar to traditional design functions, except at a larger scale. Under these conditions the public urban designer and private sector designers share more goals and knowledge, as well as the possibility for greater mutual understanding and cooperation.

Methodology in the Renewal Context The unique relationship between urban designer and private developer under urban renewal also affects the methodological orientation. Methodology tends to be subjective. Broad citizen participation has usually not occurred so that interaction between parties is on a more professional basis. Each participant group understands generally the underlying assumptions and goal orientations of the other. There is no pressure to make policies and design principles explicit outside a specific project context.

For each project, a systematic process occurs which involves local elected officials, the agency, urban designers, the developer and his designers, and other interested groups such as businessmen, the local historical society, and so on. Improving this process has been a central concern during the 60's. In 1963, Cincinnati developed a process which programmed a series of choices at each critical point,[10] so that agreement was reached by all concerned parties. By the time the plan was completed, its formal adoption was assured. Roger Montgomery in writing about the design process in renewal pointed out that newer approaches are "...aimed at 'process comprehensiveness' rather than 'plan comprehensiveness'."[11] Under these newer approaches the plan is kept more flexible and the design effort is continued throughout the life of the project. This concern with process within a project approach reflects the general interest in process orientation. However, in the project oriented activities of renewal, changes in the design process are aimed primarily at gaining acceptance of plans by increasing the involvement of interest groups. Little seems to have been done to increase the objectivity of methods used within this process. Agreement on design issues is based on mutual understanding, shared goals, and a respect for professional design judgment.

Limitations of the Renewal Context Inherent limitations exist when urban design takes place in the urban renewal context. In Cincinnati, for example, approximately one-third of the city is within the designated renewal area. With one-third of the city experiencing on-going urban design, the other two-thirds of the city usually receives minimal design attention. In most cities, however, less than one-third of the city has been designated for renewal. Minneapolis and Philadelphia have approximately 25 percent within the renewal area but only 2 percent undergoing redevelopment. Thus, the area of active influence may be, at any one time, a small fraction of the total designated area. In general, where there are active renewal projects the impact of urban design is significant, but since these areas are small, the visual quality of the major part of the city is usually neglected.

The extensive time required for rebuilding in urban renewal creates an additional problem. As Miner notes:

> Clearance is relatively fast; rebuilding is slow. At the early stages of the renewal project a design concept is developed and some new construction takes place in accord with it. Later some proposals come

> in that are in conflict with the plan, so the plan is amended. Frequently the plan gets amended so much that a major overhaul is required. This means a new plan by a new set of designers. The designers first step (is) usually to criticize all that was done before and impose his own design concept in the whole area, the rebuilt portions as well as those that are still vacant. It appears to the observer that urban designers cannot live with the work of any previous designer and must always remake the project in their own mold.[12]

A final and perhaps more serious drawback is the inherent limiting of design control and influence to the period of active renewal. After a project area is closed out, control over changes in that area, beyond those in land covenants, reverts to the local planning agency. When urban design takes place within renewal, equally strong visual quality regulations are not usually developed in zoning ordinances and other regulatory devices.

Recognizing this problem, the Cincinnati Department of Community Development is presently closing out a successful downtown renewal project and is proposing needed regulatory measures and review procedures. These proposals stimulated the urban design section of the renewal authority to collaborate with the city planning department in developing and proposing environmental quality district regulations.[13] These regulations, in effect, allow an environmental quality board to designate areas of the city as environmental quality districts. The board gains review and approval powers over building projects in the designated area. If it passes, the ordinance could become a model for protecting other areas of the city such as hillsides, views, and river fronts.

Joint Concept Strategy: A New Approach to Project Design

In cities without federal renewal opportunities the project oriented approach to achieving visual quality is not prevalent. Projects are either on a smaller scale (dealing with beautification projects, landscaping programs, and in some cases working on an ad hoc basis with private developers to upgrade amenity levels), or they are one of several implementation strategies within a process oriented approach to urban design.

While the limitations of urban renewal precipitated the growth of the more systematic and comprehensive process oriented approach to urban design, they by no means terminated designers' and planners' interest in the project approach. Rather, a new concept emerged; it is known as the Joint Development Strategy and attempts to overcome the basic limitations of project design in the urban context.

Adverse citizen response to the Bureau of Public Roads' planning for urban interstate highways resulted in a series of publications from the U. S. Department of Transportation that formed the basis for the Joint Development Concept. It was first articulated by Frank Turner in a speech to the American Association of State Highway Officials in 1966. He said:

> ...Limitations work against our own responsibility and efforts to provide cities with an adequate transportation system, as well as the many other accommodations needed to make cities better places in which to live, work, and enjoy life. While this is a problem, its solution can also afford to us an opportunity. To assist in solving this problem, and to take advantage of the opportunity present to rebuild our cities, the Bureau of Public Roads has developed a concept for the joint cooperative development of urban freeways simultaneously with the provision for other needed urban accommodations.[14]

While the concept obviously evolved as an effort to gain public acceptance, its aim was to use the impact of highway building to stimulate other projects while simultaneously conserving economic, human, and land resources. Embodied in the idea of "jointness" was not only multi-use of the transportation corridor, but also the use of multidisciplinary design teams and cooperation with local governmental units.

Having accepted the "...truism that city plans do not get built,"[15] the success of urban design firms engaged in joint development projects such as the Phoenix Papago Freeway and the Baltimore Innercity Interstate design[16] had a significant impact. It created a new awareness in designers of the opportunity provided by such relationships. Struck with this new political awareness, they came to appreciate the implications of the Philadelphia, New York City, and the Cincinnati CBD renewal, recognizing the necessity for joint efforts by the public-private sector in addition to intergovernmental cooperation.[17] Designers saw in these new relationships the opportunity to overcome existing barriers such as single purposeness, difficulties in coordination, lack of public acceptance, limited capital and power, and above all, the inability of public authorities to provide more than the barest functional necessities in their capital improvement projects.[18] As Fisher-Smith noted, "A new urban design and implementation process is developing which promises to offer a better solution to the building and renewal of major elements of the city..."[19]

In this new context, both the scope of urban design efforts and the concept of jointness were altered. Fisher-Smith noted:

> The stress is on making decisions about key portions of the city which will immediately effect implementation. The Urban Design Process is city architecture. The design and implementation of the community or neighborhood or urban system as a whole...[20]

Urban design was seen as managable, well-defined projects, to be implemented within a short time span.

While the cooperation of governmental units was still seen as significant, increased stress was placed on the synthesis of public and private sector efforts. Government was no longer viewed as having the resources to implement satisfactory projects while the private sector did not have the capital, the regulatory tools, or the power to acquire large sections of land. Neither by themselves had exhibited the capacity to satisfy the citizenry. If urban design projects were to be implemented, designers and planners recognized that both were necessary; neither was sufficient. The financial, land acquisition, and management capabilities of the city were needed. But the private sector involvement has to be obtained if the city was to be able to effectively leverage its own capabilities. Taking as significant the success of the Cincinnati and New York efforts, a revision of the Joint Development Concept recently emerged, expressed by the staff of the Department of Housing and Urban Development as follows:

> Joint development is the construction of major segments of the built environment by a public-private developer. The objective is the marshaling of public powers and private resources to create a higher quality 'built environment...'[21]

The revised concept sees as critical the creation of a public-private client that can effectively bring together the resources of both and achieve community approval. The focus remains on key projects which in themselves will improve the environment for subsequent projects.

In the belief that this approach has considerable merit for improving the environment, the Environmental and Land Use Division of the U. S. Department of Housing and Urban Development is currently sponsoring a study of the idea. Under the title, "Case Studies on Joint Development Strategies," approximately thirty-five case studies are being conducted of agency roles, design and development processes, and project strategies. The study will evaluate effectiveness as well as identify the necessary techniques and processes and the innovations being used.

While it is too early to predict the efficacy of the Joint Concept Approach for general usage, there is general agreement as to its success in several instances. Presumedly, the HUD study will evaluate its generability and applicability to urban design projects. It is clear, however, that the ultimate success of this approach in implementing key design projects will be predicated on its integration with a well-conceived process oriented design program.

The Process Approach to Achieving Visual Quality

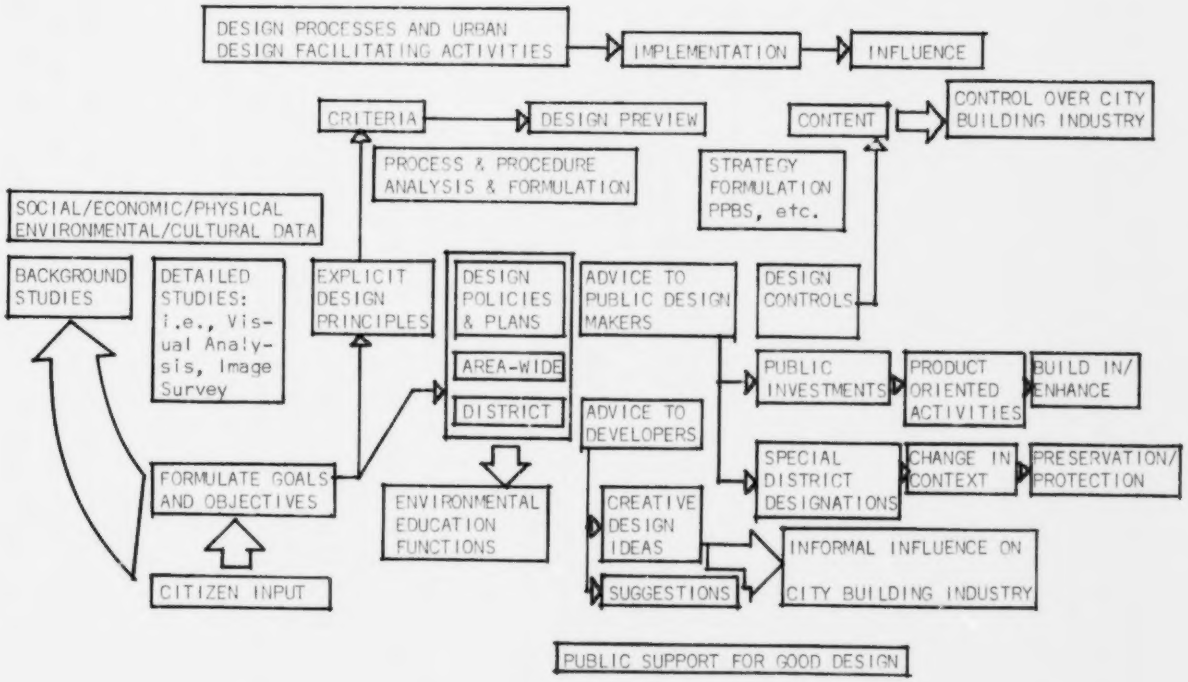
Two Basic Models The evolution of a process orientation in urban design is the most fundamental change that has taken place in urban design practice and has extended significantly the achievement of design objectives. While such programs are generally carried out within a comprehensive planning context, there are two basic models. In one case the urban design study is conducted independently of other planning studies. The focus is on design issues with the intention to develop "...an overall design statement to guide...physical development,"[22] or to "...serve as a framework for the discussion of the direction that the city's design and development should take."[23] Subsequently, the urban design study is integrated with social, economic, and technological studies to generate a comprehensive plan. San Francisco[24] and Seattle[25] have conducted such urban design studies.

In the other basic model, urban design concerns are incorporated within comprehensive planning processes. In this approach design studies are developed simultaneously with other planning studies with integration at critical stages. The emphasis is on the city's "physical form and appearance"[26] and its "form and structure."[27] Urban design is concerned with interrelating "...functional, esthetic and social needs into a physical framework. It attempts to achieve a coherent yet varied order in which individual parts can be identified and related to the overall form."[28] Minneapolis and Dallas have followed this approach. In the Metro Center 85 report from Minneapolis, economic, physical and social issues were studied. The plan itself is presented in sections dealing with successively more detailed aspects of the area. A land use framework occurs first, followed by a circulation framework, a visual image framework, and finally a section on environmental quality control.[29] Taken as a whole, these sections represent a comprehensive framework for development. While the former approach benefits from independence and concentration, it suffers from what has been called "retry" problems--the capacity to integrate individual items with each other and into the planning process.[30]

Developing the Process Approach The process approach is developed through a number of identifiable stages (See Figure 7-2). Phase I is usually an inventory and analysis of the city. Such studies vary as to the attributes which the designer believes are important. Independent urban design studies concentrate on form and form related elements. The San Francisco study, for example, analyzes topography, major form elements (transportation routes, open space, building mass, and hills), micro-climate, general building types, existing form controls, views, noise sources, boundaries, neighborhood associations, maintenance, development improvements, and historic sites as background information.[31] More recent studies have expanded this list to include additional physical attributes as well as natural environmental elements. Dallas, for example, has included

FIGURE 7-2

PROCESS ORIENTED URBAN DESIGN


DESIGN PROCESSES AND URBAN DESIGN FACILITATING ACTIVITIES
IMPLEMENTATION
INFLUENCE
CRITERIA
DESIGN PREVIEW
CONTENT
CONTROL OVER CITY BUILDING INDUSTRY
PROCESS & PROCEDURE ANALYSIS & FORMULATION
STRATEGY FORMULATION PPBS, etc.
SOCIAL/ECONOMIC/PHYSICAL ENVIRONMENTAL/CULTURAL DATA
BACKGROUND STUDIES
DETAILED STUDIES: i.e., Visual Analysis, Image Survey
EXPLICIT DESIGN PRINCIPLES
DESIGN POLICIES & PLANS
AREA-WIDE
DISTRICT
ADVICE TO PUBLIC DESIGN MAKERS
DESIGN CONTROLS
PUBLIC INVESTMENTS
PRODUCT ORIENTED ACTIVITIES
BUILD IN/ ENHANCE
ADVICE TO DEVELOPERS
SPECIAL DISTRICT DESIGNATIONS
CHANGE IN CONTEXT
PRESERVATION/ PROTECTION
FORMULATE GOALS AND OBJECTIVES
ENVIRONMENTAL EDUCATION FUNCTIONS
CREATIVE DESIGN IDEAS
INFORMAL INFLUENCE ON CITY BUILDING INDUSTRY
CITIZEN INPUT
SUGGESTIONS
PUBLIC SUPPORT FOR GOOD DESIGN

ecological and cultural studies in its data bank.[32] (The former, in addition, is being used for the evaluation of regional transit corridors and for review by citizen groups of environmental impact statements.) The Seattle Urban Design, Report I: Determinants of City Form, analyzed a number of elements of the natural setting including slope, soil characteristics, shadow patterns, and landslide hazards.[33]

When urban design concerns are addressed within planning studies, the list of inventory elements is broader, usually including economic and social as well as physical, cultural, and ecological factors.

The initial collection of background information is usually supplemented by studies conducted in a manner reflecting the current trend toward systematic methodology. The most common is some adaptation of Lynch's techniques for analyzing city images[34] or views from the road,[35] though studies of user preferences and behaviors are increasing in number.

The San Francisco urban design study extended the scope of environmental form and image surveys. In Preliminary Report 4: Existing Form and Image, four surveys were carried out: (1) Quality of Environment Survey; (2) Internal Pattern and Image Survey (a modified "Image of the City" study); (3) Road Environment Survey (included a modified "View from the Road" study); and (4) External Form and Image Survey.[36]

The "Quality of Environment Survey" evaluated nine factors: quality of maintenance; quality of view; visual interest of street facade; block variation; distance to open space, presence of nature; compatability of nature; clarity of local image; and micro-climate. Each factor was evaluated on a five-point ordinal scale that allowed reasonably standard rating. While judgments were required in evaluation, the decision rules were made explicit. The survey was conducted on a block basis and was used to identify problems and deficiencies. The data were synthesized, and a graphic display identified the location of below-average and poor areas of the city. The areas identified in this survey corresponded closely with resident ratings obtained in "A Social Reconnaissance Survey" conducted in the fall of 1969.

The second study, "Internal Pattern and Image Survey," ...entailed the identification, evaluation and charting of those physical features that contribute to understanding the structure and organization of the city.[37] The emphasis in this study is on focal points, viewpoints, landmarks, terrain, and movement patterns. The analysis of these factors was combined with the "Quality of Environment Survey" to present an interpretation of problems and opportunities by planning areas.

The "Road Environment Survey" had as its purpose the development of policies and guidelines for improving the city's road environment. It looked at five aspects: major citywide destination; citywide form elements; roadway character; roadway identity and structure; and roadway information. The system was evaluated according to seven criteria: maintenance; spaciousness; order; monotony, clarity of route; orientation to destination; and safety and ease of movement. Again, measurement scales were used, and criteria rating descriptions were made explicit, verbally and through photographs.

The final survey, "External Form and Image," presented a "...graphic record of the city's existing skyline and its massive patterns..."[38] Photographs were selected and evaluated for unusually significant features. The study later provided background analysis for development of height and view preservation policies.

In the final phase of the study, the four surveys were displayed on two maps. The first, a summary map of visual elements of city form, highlights the overlapping distribution of visual elements. The second, a summary map of visual problems and potentials, represents an attempt to:

> ...Subdivide the city into a number of areas that, as a result of the survey, seem to be visually cohesive and are distinct as definable enclaves within the whole fabric of the city. The importance of this attempt is to begin to delineate some districts for specific urban design form studies.[39]

This set of detailed surveys is an example of an attempt to deal more systematically with inherently subjective phenomena. With careful development of explicit decision rules and criteria, general agreement can be reached prior to environmental analysis. Preconceptions and biases are minimized, and resulting analyses are more credible.

Phase 2 of the process oriented approach is concerned with formulating goals and objectives defining what should exist. It is here that primary efforts to obtain citizen input are made. The San Francisco study used three techniques:[40] an advisory committee of citizens representing a broad range of interests and concerns; staff perceptions of public hearing activities; and surveys carried out as a part of the study. Techniques, used elsewhere, include neighborhood meetings, public presentation of design issues to citizen organizations, and public hearings.

In urban design studies that are part of comprehensive planning studies, the same techniques to obtain citizen data can be used. The nature of this approach encourages longer term, ongoing connections with community groups and the general public. Permanent two-way communication channels are established to increase the quantity and quality of the involvement and information.

Dallas is currently developing a citizen input technique referred to as "responsive design."[41] This program emphasized the importance of knowledgeable citizen input, and their involvement is sought in several ways. Surveys are extensively used, offering a broad-based reading of public opinion from which some statistical interpretations can be made. Another technique is use of citizen groups to conduct studies. In the recently completed ecological study, for example, local environmentalists helped gather and code basic data. This, coupled with publicity concerning the purposes and issues to which the study was addressed, helped to make the general public more aware of environmental problems and opportunities in Dallas.

Dallas also attempts to raise the level of public awareness. It uses three techniques for educating the public. The staff is encouraged to address civic groups and governmental units at every opportunity to reach the organized segments of the community. A second technique is exhibitions. A recent one, "Options for Tomorrow's City," involved the viewer in making a series of choices which reflect basic alternatives for future development. After the viewer made a choice, its consequences were displayed. At the end of the exhibition, a multiscreen slide presentation reviewed each basic choice and its consequences. A folded poster was given to the viewer so he could record his choices. The poster also provided information on how to get involved. This type of educational effort has the potential of reaching a broad segment of the population. Finally, the urban design staff worked closely with the school board in developing a technical high school curriculum for training planning and design para-professionals.

Formulation of goals and objectives provides the basis for Phase 3, which delineates the design principles to be followed. These principles establish the "...fundamental rules governing the methods of achieving esthetic and functional urban design goals and objectives..."[42] Usually, design principles are developed at citywide and district levels, especially when there are districts which have unique qualities. In some cases, principles are developed with respect to the goals and objectives to which they most closely relate (amenity, comfort, and visual interest). In other cases they may be related to the functional area with which they deal (streets, open space, and building type). Regardless of organization, principles are not project specific but can be used to evaluate designs submitted by private developers.

It is considered extremely important to make design principles explicit. It alerts architects, builders, and developers to the city's concerns. Some cities have formalized this by preparing "developer kits" which are distributed to anyone interested in developing land. Explicitness also provides evaluation criteria for review procedures--an important factor when exercising regulatory controls over private property. When design principles are published, they serve to educate and call public attention to design issues.

Factual and analytic background data, goals and objectives along with design principles are the basic ingredients for Phase 4: The Development of Design Policies and Plans. It is in this phase that data are synthesized to generate solutions to design problems. In a process orientation, these tend to be policy plans rather than project plans. Although site plans and other designs are often presented, their purpose is to illustrate the design principles involved or to exemplify the effect of a proposed design policy. This is one of the fundamental distinctions between a plan produced under a process approach as opposed to one produced under the project approach.

Design policy plans developed as a part of an independent citywide urban design study usually address both citywide and district concerns. Other policy plans are developed as detailing of, or background to, a comprehensive plan. As background, these plans deal with both citywide and, to a greater extent, district levels of concern. However, they are distinguished from the first type by the fact that they are not intended to stand alone and as part of planning studies, the substantive area of concern is much broader. Another purpose for generating policy plans is in response to specific problems and issues with which the city must deal. These plans vary greatly depending on the problem and issues.

An example of a design policy plan intended to stand alone as one element of a comprehensive plan is the San Francisco Urban Design Plan. The Urban Design Study actually resulted in two plans. First, Preliminary Report 8: Citywide Urban Design Plan proposed a series of urban design guidelines. The citywide guidelines are to "...provide a basic framework for more detailed urban design plans at the district and neighborhood levels."[43] The proposals are organized into five aspects of physical form and environment: (1) open space and landscaping; (2) street design; (3) the preservation of street spaces; (4) the height of buildings; and (5) the bulk of buildings. The plan takes a policy stand on those elements of the city over which the public body exercises control.

In the final urban design plan for San Francisco, a stronger policy focus was taken.[44] As an element of the San Francisco comprehensive plan, it is concerned with the "physical character and order of the city, and the relationship between people and their environments."[45] The plan is organized around four areas: (1) city pattern; (2) conservation; (3) major new development; and (4) neighborhood environment. For each area the plan defines human needs, specifies the objectives toward which both public and private efforts must be directed, and presents fundamental design principles. It then proposes

> "...a series of policies necessary to achieve or approach the overall objective, which acknowledge

> the needs and principles, and which provide a continuing guide and directive for public and private decisions pertinent to this plan."[46]

The Oakland urban design report, although employing a different study method than San Francisco, has some of the same characteristics. It presents design policy proposals intended to creatively direct the inevitable changes to achieve a number of broad design objectives.[47] Design objectives are to be achieved by creating "...a logical, visable framework which organizes and stimulates private development."[48] Like the San Francisco report, these policies and proposals focus on areas where public control is fairly direct.

Design policy plans that deal with citywide design problems serve two primary functions. They act as a policy framework for development which has citywide importance, and they set a policy framework for urban design studies and policy plans at the district and neighborhood levels. The background analysis often identifies districts with which later studies should be concerned. Usually, only critical districts and areas are treated in the initial study, if particular areas are considered at all.

The Visual Environment of Los Angeles, a study analyzing the city's image, is an example of an urban design study that is an input to the General Plan for Future Development.[49] The first section deals with physical form, visual form, images of the city, and visual criteria for city design. The visual analysis serves to illuminate problems and opportunities. These are detailed for the transportation system, activity nodes and special districts, major landscape features, residential areas, citywide visual factors, and the visual environment as a whole. This is followed by proposals of action for visual improvement. One recommended action is incorporation of the study's visual objectives and principles as an integral part of the comprehensive general plan. Another recommendation is that the study be "...followed by more detailed studies of two types: (1) in-depth analyses relating to the visual elements and factors; (2) local visual surveys conducted as a part of studies for the preparation of community plans for the various parts of the city."[50]

Additional actions were proposed to increase citizen participation and achieve more direct implementation through: (1) project oriented urban design activities; (2) regulation of development; and (3) persuasion.

Design policies developed within the comprehensive plan generally deal in detail with a critical district. They may focus on a functional area such as housing or transportation, though usually these are in plans responding to current problems and issues. Because of the more limited district focus, the urban design concerns are more specific and permits more immediate implementation. For example, the Northern Waterfront Plan for San Francisco, an amendment to the San Francisco Master plan, deals with specific urban design objectives, policies, and concepts.

Design policy plans are often produced in response to topical problems and issues. These plans generally focus at the district level; CBD's, historic and cultural areas, and areas with significant environmental elements are frequent targets. In addition, they often focus on functional items such as transportation in the central area. This type of plan is most often found where urban design activities are closely integrated with comprehensive planning and are generally treated as one aspect of the total substantive concern. Metro Center 85,[51] a report on central Minneapolis, and the report, New Patterns[52] (from the same agency), are examples of this application. The latter report deals with a Model Cities area and focuses on transportation options for Model City residents. The plan embodies urban design concerns in the sections on environmental patterns and transportation patterns.[53] Metro Center 85 discusses pedestrian circulation and related amenities. New Patterns, in addition to dealing with air, water, and noise pollution, considers aspects of the visual environment such as building illumination, lines of movement, signs, and street furniture.

A recent Atlanta, Georgia, study focuses on increasing access to the central area. In this plan, urban design proposals are project oriented, specifying physical actions rather than policies which might guide these actions.

While it is hard to generalize on urban design proposals in planning studies of this type, their value in raising urban design concerns is significant. Urban design within a comprehensive planning study gains both relevance and strength: relevance in that it is focused on a district where simultaneous improvement efforts are being made; strength in that competition with other issues keeps urban design proposals from being developed in a vacuum.

Implementing Urban Design Objectives Within the Process Approach

The distinction between project and the process approaches tends to blurr during implementation. In the classic project approach, implementation is through actual development--construction of the project by the local authority. In the implementation of urban renewal and similar projects, however, various advisory, control and incentive guidance tools are used as well. In practice, the urban design framework created by urban renewal, together with bulk and density controls and design review procedures, acquired the characteristics of an urban design guidance system similar to that used in the process approach. The inherent limits of the urban renewal project created an awareness of the importance of the implementation stage and the need for more effective control, incentive, and advisory guidance instruments. In order to more clearly understand the use of implementation tools in a guidance framework, it is better not to distinguish between the two approaches. The following discussion of guidance tools will focus on those normally associated with the process approach.

A variety of process approach guidance instruments are currently employed to improve the visual quality of the environment. For the most part, these are the same basic tools that have been used by planners since the late 1950's. Most recent changes can be viewed as attempts to broaden the scope and degree of control, improve the quality of decisions being made, and increase flexibility and capacity in dealing with unique or unusual conditions.

In the main, these guidance tools are embodied in the substance and administration of controls such as subdivision, building, outdoor advertising, appearance, bulk and density, special use and district, and site plan review. Incentives are frequently made a part, explicitly and implicitly, of these control type tools, as for example, in floor area ratio regulations. Advisory type tools, though common, are not nearly so widespread as control types, being found in the form of information pamphlets, brochures, and exhibitions. Advice, per se, appears constantly as part of the daily interactions between planning officials and developers. At the cutting edge are new refinements predicated on better information and environmental analysis, and perhaps most significant, guidance instruments developed as part of a holistic process approach.

A subtle but significant difference exists between advisory and some control type tools. Controls fall into three major categories: (1) those embodied in ordinances regulating specific characteristics of visual elements and/or elements within districts; (2) those embodied in ordinances specifying review processes but in which operational requirements, with respect to visual elements, are, at most, semi-specific; and (3) those informal influences embodied in formal processes and informal interactions between the authority and the developer where requirements are unspecific.

The first category includes typical zoning and subdivision requirements and nuisance ordinances. The visual quality objectives may be explicit, as in an appearance or sign ordinance, or they may be implicit, as in bulk and density control ordinances. Whether the goal is implicit or explicit, requirements as to physical form are usually specific and factual, and determination of compliance is factually premised. Control, or implementation of the requirement, is embodied in the police power and, as such, the outcome of each design is reasonably definite and predictable. As a corallary, such tools are relatively limited with respect to adapting to unanticipated problems such as unusual site conditions and unique building designs or site plans.

These instruments usually specify minimum or maximum performance requirements with respect to building form. Limited by judicial sanctions, they tend to eliminate the poorest quality urban elements rather than to generally improve the visual environment. Since there is also a tendency to eliminate the unusual, and hence excellent, design as well, the use of these tools tends toward a mediocre environment rather than one of improved overall quality. Nevertheless, for several reasons such controls are extremely popular. Esthetic sanctions are buried in others readily acceptable by the courts. They are simple and quick to administer. requiring personnel with minimal design ability. And, they provide an adequate response to most poorly designed development proposals.

An inherent characteristic of ordinances, such as bulk and density controls, is their ultimate impact on form. Frequently, they do not embody explicit or implicit visual objectives. Many such ordinances, negatively affect visual quality since they are not written with these objectives in mind.

The second category of control instruments includes a variety of administrative and quasi-judicial regulatory processes, such as review procedures for architectural control, design, special use permits, site plans, and even variance approval. The esthetic intent in these cases may be explicit as, for example, in the case of design review or planned unit development review; usually, however, it is not.

In other formal processes regulating development, such as the review of special uses, esthetic objectives are usually unstated though frequently implicit. In this guidance instrument, requirements for physical form are essentially non-specific and judgment is used to determine conformance. Occasionally, requirements may be semi-specific, as in the form of design policies.

As in the first category, implementation is embodied in the police power but due to the lack of specificity, the environmental outcome is indefinite and only semi-predictable. On the other hand, such controls are more flexible than the element-specific type and can deal with unique contextual situations and designs. (Flexibility is presumably limited by judicial constraints, though as will be discussed later, even this is, to a large degree, negotiable.) It is for these reasons that such ordinances have embodied most recent innovations and have increased so significantly in use during the last decade.

The third category, informal influence, is usually thought of as a type of advisory instrument. It includes those informal means by which a planning agency can influence the visual quality of development. The medium for this set of guidance instruments includes the daily transactions between developers and planning officers, commissioners, etc., as well as the formal interactions described earlier. In these cases, goals and objectives are unspecified except as implied, and particular requirements do not exist. Both are usually conveyed to the developer as advice related to an individual project. Guidance is achieved through informal power, derived from sources such as the charisma of the planning staff or review board, forms of remuneration, implicit sanctions, harrassment, and negotiation.[54] (It is important to note that advice is often an effective form of remuneration; this adds to the difficulty of distinguishing between advice and control type guidance tools.) Unless constrained by design policies, the outcome of the use of advice as a guidance tool is indefinite and unpredictable. Its capacity for flexibility, however, is great as is its range of application. Advice is not limited to specific elements or districts, nor is it constrained by judicial or legislative limits. In this sense, it is probably the most pervasive guidance tool for achieving visual quality and may well be the most potent. But, given the lack of specificity and the tendency toward capriciousness which pervade its use, advice is the most difficult control to identify and to evaluate for effectiveness.

When advisory type guidance instruments, through implicit sanctions and harrassment, become regulatory in nature, an ethical problem arises. This increases as objectives extend beyond the powers permitted by the law. Some planners argue that such devices are a poor substitute for an adequate guidance system and need not and should not be used. Nevertheless, their use is pervasive, apparently filling a gap as agencies slowly respond to changing conditions and attempt to cope with legislative constraints and legal limits. On the other hand, when power is derived from the personal charisma of the planning staff or services it can provide, the process does not generate stress, and the ethical overtones are seen as less significant. Given personnel and programs emboding these characteristics, the technique achieves substantial results.

While these three types of control guidance tools can be distinguished, it must be borne in mind that often two or more are employed simultaneously with respect to a particular building application or program. The use of informal types of influence frequently accompanies the exercise of element-specific ordinances. Site and design review of planned unit development is apt to be accompanied by both other types and to significantly depend on the opportunity to exercise them. It is probably fair to say that one of the significant strengths of opening lines of communication with designers early in the design process is the possibility for exerting informal influence for design changes at a time when they can be accommodated.

While combinations of these specific tools are always employed by local planning agencies, it would be unfair to say that many are consciously developed as integrated guidance systems. Rather the tools appear to be adopted and applied on a piecemeal basis with frequent inconsistencies in ends, substance, scope and application, and criteria. Element-specific ordinances are common, consisting of requirements borrowed from model ordinances with little consideration for either local visual requirements or relationships to other regulations. As such, they are often contra-productive with respect to the visual objectives implied in the element semi-specific ordinances.[55] A pervasive and significant example of this is the relationship between bulk and density controls and parking requirements in commercial and institutional zones. Often, parking requirements are the effective control of bulk, and visual quality objectives embodied in the actual bulk and density controls are thwarted.

In this context it should be noted that a variety of ordinances exist which, though they are not under the planning administration, bear upon the visual quality of the environment. Health, fire, and traffic engineering ordinances, for example, which specify distances between buildings, width of roads and cul-de-sacs, building density, and even bridge form affect the visual quality of the city. Such ordinances are often inconsistent with development controls regulating the same environmental elements, but more to the point, they are often premised on technical requirements or standards which themselves are subject to question and modification. Such standards are usually solution specific, but the objectives are capable of being satisfied in a variety of ways which could be consistent with the esthetic objectives of the community. In spite of local agencies' increased use and variation of guidance tools to improve visual quality, many available tools are under-utilized or not employed at all. Lack of awareness of inadequacy of personnel accounts for this condition in some cases.

Although use of the police power to achieve esthetic ends has been increasingly liberalized during the past several decades, there remain limitations and ambiguities that discourage its use by many local authorities. Also, there is a reluctance among many political leaders--under pressure by influential sectors of the public--to adopt or rigorously apply legislation of any type for this purpose. In some cases, this simply reflects the belief that the regulation of esthetics is not a community concern which justifies infringement on private property rights. In other cases, planners and designers are convinced that such guidance tools cannot significantly improve the visual quality of the environment. And, in many cases, the reluctance to use such tools results from a fear that the courts will find esthetic regulation unconstitutional, thus eliminating the limited power that now exists. As a result, many esthetic guidance components now in use are embedded in other more basic tools; this gives them a low profile and also provides justification for using the police power. While special district, special use, and the planned unit development instruments have not been adopted specifically to achieve esthetic ends, they serve as powerful tools for achieving this goal.

There are some instances where more systematic methodologies have been employed with respect to the use of process tools by local planning agencies, but these have been the exception rather than the rule and are limited, for the most part, to large cities. Intuition, traditional design principles and standards, and the use of expert, and even lay, opinion continue to typify the substantive state of guidance tools for improving visual quality. Few communities have evolved new tools or updated existing tools by employing systematic techniques of inventory, analysis, or evaluation. Few have attempted to employ currently available scientific data on user responses or participatory strategies to assist in defining their guidance tools or objectives. Fewer still have developed design plans or design policy frameworks to integrate their programs, refine sector objectives, or minimize arbitrariness and capriciousness in individual decisions. Objectives with respect to the visual quality of the environment continue to be expressed by phrases such as harmony and unity, with few examples of more definitive criteria. The focus continues to be restricted, for the most part, to the district and element level at least with respect to using specific tools.

Innovative Guidance Techniques

For the most part there appear to be few innovative tools that are truly unique or have been newly developed. Primarily, they are modifications of existing devices. However, many tools are at the cutting edge in that they are relatively recent in application by a small set of municipalities.

Current guidance tools for achieving visual quality, when used in combination and integrated into guidance systems possess the potential for influencing development. If tools are viewed individually in this context, it is possible to better understand their potential effectiveness and scope of application in terms of environmental context and substance.

Unfortunately, there has been little if any investigation of the synergistic qualities of combinations of these tools, a matter of extreme importance to their optimum utilization. The reader, however, should be aware of a Department of Housing and Urban Development study, "Case Studies in Joint Development Strategies," currently being executed. This study should produce data on this subject as well as on the role of the private sector in the guidance system.

Density and Bulk Controls Permitted height, lot coverage, and yard requirements have been mainstays in controlling visual quality. These controls continue to be used extensively by local planning agencies. While they are specific in substance, their objectives as to visual quality when they exist are usually implicit. Their value in contributing to visual quality is their capacity to define the basic form and grain of the urban fabric. This is vitiated to some extent, of course, by the necessity of applying them uniformly to land-use sectors of the community which often produces monotony, and by specifying maximum densities.

spatial distributions and grain, etc., which often produces unpredictable and chaotic results. In essence, the bulk and density envelope limits development, but does not have the capacity to produce the form defined by the regulations. Thus, particularly in commercial areas, the basic structure defined conceptually by the ordinance is destroyed by the gaps.

The increasing reliance on controls such as floor area ratio (FAR) attempts to provide for additional flexibility, variety in form, and increased open space, while still controlling density and basic unity. The FAR framework, which may be accompanied by height or yard regulations, provides the designer with considerable flexibility and, presumably, the urban form with variety of height, spatial quality, and increased open space. In order to reinforce these objectives and other visual amenities, incentives, such as increased net floor area, are provided to make the regulations more attractive to developers or to provide greater assurance that the envelope will be filled. Often, however, such incentives do not exist or are not sufficiently attractive to the developer.

With respect to FAR, per se, there are several innovative techniques being employed which may enhance environmental quality, such as including only net rentable space or excluding basement space as incentives to achieve other objectives; exclusion of area in certain uses that will add to the amenity of the area; and making mandatory design review approval a prerequisite of certain bonuses.

The FHA Land Use Intensity (LUI) scale is another innovation in this area. The technique shows great promise for providing flexibility and achieving environmental amenities but is not yet widely used outside the context of FHA related development. While it provides an objective technique for enforcement, its administration requires a high degree of skill and the model does not respond well to manipulation to suit local conditions or values.

A situation frequently detrimental to environmental quality results from residential densities being premised on the assumption of level site conditions. Varied topography limits site plan alternatives since the developer tends to use flat areas for both buildings and parking. This often results in undesirable design qualities and environmental degradation.

Bair notes that "...the Honolulu ordinance relates per cent of the lot which may be covered by buildings to the slope of the base line."[56] Thus as slope increases, ground coverage decreases, opening up site design alternatives and reducing the disturbance of natural conditions. While this does not take into consideration the degree of variation, it is a step forward.

While bulk and density requirements are embodied in virtually all zoning ordinances, it would appear that their full potential as a basic structuring device is not being realized. While this may be due in some instances to conflicting requirements, obvious inconsistencies suggest that this results from a failure to design the ordinances for these purposes.

Visual Nuisance Control A recent publication has made a significant contribution in pulling together a variety of guidance instruments that can be used to regulate four appearance problems: weeds and other vegetation; refuse and litter; outdoor storage; and utility wires and equipment.[57] The report discusses the full range of guidance instruments which can be applied to these problems both with respect to maintaining assets and controlling detractors. Particular attention is given to utility wires. Given the recent study by A. D. Little, indicating the saliency of utility poles as an element degrading to environmental quality, this section takes on added importance.[58]

View Protection Regulations While a concern for scenic view has been part of many urban design studies and plans, and part of the rationale for many billboard regulations, the protection of public and private scenic views by municipalities is relatively new and uncommon. A variety of tools can be used including granting tax abatements and purchasing development rights and easements. However, several cities have creatively employed existing zoning regulations to more effectively preserve and enhance this dimension of the visual quality of the environment.[59] By specifying view protection as a public goal in the ordinance, building height, bulk, and spacing can work effectively to preserve views. These regulations can be applied as special zoning districts or as overlay districts, or to preserve particular types of views.

Residential areas of varied topography are a frequent focus of view problems. A recent study by Frederick Bair on height regulation in residential areas proposes the use of light planes on sloping lots as a way of protecting view.[60]

Outdoor Advertising Two major proposals have recently been published which can have significant potential in the war against sign proliferation. The first, a study sponsored by the American Society of Landscape Architects and conducted by William Ewald, is directed primarily toward the auto oriented street.[61] Integrating concepts of information theory with perception theory, it presents a systematic but simple method for sign regulation on major streets. Perhaps its most significant contribution is a focus on and limiting of the quantity of information in addition to conventional limits on size, location, and so on. Since the former obviously relates to the latter, the reduction of signage is reinforced. Notably, it also recognizes special needs and proposes special sign districts as a vehicle for handling such situations.

Another recent study by Ashley/Myer/Smith for the Boston Redevelopment Authority and the Department of Housing and Urban Development develops a comprehensive program for signs and lights.[62] Viewing these elements as an information system, they developed a citywide system and method for implementation, using the process approach described earlier in this chapter. Both Boston and Dallas are currently preparing new sign ordinances based on the results of this study.

Development Rights Transfer The capacity to transfer development rights between adjacent properties has significant implications for achieving visual quality. On the one hand, it creates the opportunity to create more variety than can normally be attained in lot zoning while offering benefits to the private parties involved. Greater assurance of quality can be obtained by making design review a prerequisite of the transfer and, as in Houston, Texas, providing that the deed restriction is transferred to the municipality for continuing enforcement.[63] While this tool has had limited application to date and legal issues may arise, it shows great promise. (See additional discussion under Historic Preservation.)

Planned Unit Development The PUD continues to offer the potential for achieving levels of creativity in design and visual and amenity quality in the environment not possible by more conventional techniques.[64] In spite of claims as to the newness of the concept,[65] "for all its innovation, (it) is nothing really new, but rather a growing sophistication of the existing means of land use control."[66] Premised on providing flexibility, it tends to combine existing element specific tools, with extensive design and site plan review. There appears to be, however, continued reluctance to implement PUD's. The concept is plagued by what has been called the "one-acre mind" of the suburban resident[67] and the fear of living next to a hi-rise.[68] While flexibility is one of the basic objectives of the PUD, authorities continue to fear its socio-economic implications.

A recent innovation of significance in PUD involves applying the concept to non-residential uses.[69] In East Windsor Township, N. J., the concept was applied to an office park. In another case in Twin Rivers, N. J., the concept was applied to a "micro-city" combining various residential land uses with commercial and industrial facilities. In both cases, seeking to achieve more flexibility, provision is made for approval of increments of the development, thus permitting the developer to respond to changing conditions.

In another case, a residential PUD in New Hope, Pennsylvania, a development framework consisting of permissible density, open spaces, and the like has been established, but the Planning Commission has approval powers regarding placement of buildings, open space, infrastructure, and so on.[70]

A provision for view protection has recently been made a specific component of several PUD ordinances.[71]

An important aspect of PUD as with any site plan review technique, is the possibility of requiring design review and approval as a prerequisite for the PUD or for exceeding certain limits specified in the ordinance.[72] In some such cases, for example, Montgomery County, Maryland, the developer can receive bonuses in terms of number of dwelling units or permitted densities for what the review body determines is unusually good design.

Special Districts The use of Special Districts has already been mentioned in the context of regulating views, historic areas, and signs. While the tool is not by any means new, the variety of its applications for achieving visual quality and amenity is increasing. New York City has recently "...created several special zoning districts in recognition of the differing neighborhood needs within the city..."[73] A sophisticated example of this is the Special Greenwich St. Development District. An intricate objective system of floor area bonuses has been created for providing a variety of amenities, both on a mandatory and elective basis. These bonuses are consistently related to defined objectives. This process provides the developer with significant flexibility and incentives. Because of its factual specification, it reduces the manpower costs involved in judgmental design review procedures.

Transitional Districts are a recent proposal for easing the visual transition from one zone to another. In principle, they provide that where one zone abuts another along a thoroughfare and the visual qualities are incompatible, a strip district along the thoroughfare can be created with special requirements or review processes to accomplish a reasonable transition. This is not an additional zone but a district overlayed on existing zones. The technique is particularly useful for strip development interspersed with land uses such as institutional or residential. While the concept seems to be legally valid, Lee notes that its political acceptability is another matter. Realtors and developers can be expected to fight it.[74]

Special Uses The use of this source of control is increasing since it brings flexibility into the regulatory process. The concept is predicated on an acknowledgement of certain adverse characteristics associated with the particular land use. The process provides the opportunity for exercising discretion in vitiating these adverse conditions. This can mean improving the special use's visual quality vis a vis its relationship to its context and the provision of certain amenities to amelioriate the situation. These objectives must be explicit, and a policy framework should be established for guidance as well as communication.

Design Review Frequently, this function is absorbed into other review procedures such as site plan, PUD, and special use review. The popularity of architectural control, or design review, as a separate function, however, appears to be increasing significantly.

Major innovations are taking the form of greater comprehensiveness, more rigorous analysis and use of scientific data, explicit policies frameworks and design criteria, and clearer recognition of existing districts with unique substantive and administrative requirements.[75]

Such a distinction is beginning to emerge, as for example in White Plains, N. J., where architectural controls for residential areas are specified in the form of specific look-a-like criteria and administered by the building inspection division. No discretion of judgment is involved, and developers have a clear understanding of the requirements. On the other hand, the authority perceives the need for greater flexibility in commercial areas and has mandatory design review by a special commission of all proposed buildings in this district.

Boston has acknowledged the need to reflect local values in unique visual districts in the design review process. It has created independent review commissions for Beacon Hill and Back Bay made up of residents of the respective districts.[76] This stresses the unique qualities of the individual areas and builds a citizen participatory function into the procedure. It is a model which could serve well as the application of this device is expanded to city areas which have a strong local focus and interest.

In spite of the fact that a number of communities are pleased with the use of design review, many problems exist which curtail its use and effectiveness. As noted earlier, its legality and/or political acceptability curtail its use as does its utility. A question of concern is arriving at a basis for judging acceptable, or good, design and the accompanying tendency for capriciousness and arbitrariness. There can be little question that the use of more systematic methodology as suggested under the process approach, the use of more rigorously defined data on preferences and values, and the concern for local values exemplified in Boston will do much to ameliorate many of these problems. Likewise, the efficient use of advisory techniques in conjunction with regulatory ones will expand the scope and quality of influence.[77]

Variances Variance review is potentially a powerful tool for achieving environmental quality, but its explicit use is not common nor is it often integrated into other visual quality or amenity efforts. The review of development projects requiring variances provides the opportunity for integrating adverse conditions with design qualities. Some large cities have gone so far as to maintain zoning requirements which force proponents of large development to request variances. In Boston, when this occurs, the Board of Adjustment requests advice from the urban design staff of the Boston Renewal Authority.[78] This approach provides the opportunity for expansion and coordination of city design efforts. While obvious ethical and professional questions exist with respect to using this device, the adverse implications of a unique land use suggest that some problems can be averted by a systematic and consistent application of these objectives, particularly if they are made explicit.

Historic Preservation

Historic preservation means many things to Americans, embracing a wide variety of political, physical, economic, and social settings, as well as historic sites, buildings, structures, districts, and objects. The present discussion of historic preservation is confined to those aspects of preservation conventionally within the purview and interest of municipal planning agencies. These, for the most part, include the preservation or conservation of physical, manmade structures and sites, both those in active or adaptive use and those not.

Even in this narrow context, it is important to understand a few of the many reasons why historic preservation may be of significance. The prevailing justifications for preservation incorporate arguments based on historical, social, psychological, educational, and economic factors. Of these justifications six rationales for the preservation of urban manmade artifacts and districts are commonly advanced. First, it is said that an environment with cultural and historical continuity is socially beneficial.

A community ought to preserve some parts of its past in order to recognize what it is, how it became what it is, and how it differs from others.[79]

Second, daily life is enriched through preservation of historic sites and buildings. This assumes that temporal variety and architectural diversity in the environment are more desirable than homogeneity and monotony and that preservation of historic architecture enriches the environment.[80]

Third, preserving the visual reminders of a community's past allows people to relate to events, ideas, movements, and persons believed to be important to understand and honor. Also, the presence of the physical past helps to fulfill society's expectations and anticipations for the environment and promotes well-being.[81]

Fourth, it is argued that notable architecture and landscapes should be preserved on the basis of their intrinsic value as art since "architecture is a synthesis and culmination of artistic endeavor and the supreme medium of human expression."[82]

Fifth, in some cases, preservation of historic areas stabilizes or increases the economic base of their locales. This was, and still is, a prevailing justification for the approval of historic district ordinances by State Supreme Courts.

Lastly, socially oriented preservation programs can be important for maintaining socioeconomic characteristics of neighborhoods. In the few cases where preservation programs are so directed, they may complement traditional urban renewal programs, with the advantage that displacement of residents is not necessarily required.[83]

Contextual Changes in Historic Preservation

Earlier in this chapter, contextual changes significant to urban design were discussed. Similar changes have occurred with respect to historic preservation. For many years an essentially private sector activity, preservation has recently moved into the public realm, and there are signs that broader citizen interest and participation is emerging. It is important to note that this is in part the result of racial and ethnic developments, with a new emphasis on separatism, and the concommitant rejection of a common or shared heritage for all Americans. Additionally, the scope has broadened to include historic elements of local community value and to occasionally recognize elements which, though not of great historic value in and of themselves, are nevertheless meaningful to the visual quality of the total urban fabric. An increased reliance on process oriented approaches, on more modern and systematic methods and techniques of analysis, and on greater integration of programs, has also occurred. Some of these changes are reflected in the National Historic Preservation Act of 1966.

The 1966 Act Under this act, historic preservation began to expand from an overriding federal preoccupation with individual buildings and structures of national importance to include buildings, structures, sites, districts and objects of state or local significance. Many existing programs and organizations were pulled together in the National Park Service's Office of Archeology and Historic Preservation, U. S. Department of the Interior. The Advisory Council on Historic Preservation, an independent agency responsible to the President but located in the OAHP, was also established by the 1966 Act to review and comment on all federal programs which in one way or another might adversely affect properties listed on the National Register of Historic Places. Although the commission does not have a veto power, its recommendations have almost invariably been accepted by the federal agency sponsoring the program under challenge.

Under the 1966 Act, a standard procedure for including properties on the National Register and for requesting funds for state and local historic preservation programs was established. The requirements stemming from these procedures have profoundly affected historic preservation involvement at the local and state levels by imposing new responsibilities on these governments. National Register listing and grants of federal funds generally go hand in hand. According to established procedures, only those states that have federally approved statewide historic preservation programs may apply. This means that local projects, in order to obtain supporting federal funds, must be included in a statewide program approved both by the state and by the Secretary of the Interior. These requirements thus set the framework and provide meaningful incentives for states to develop their

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own programs. National Register forms and procedures for nomination are generally uniform throughout the nation. One objective of these procedures is to encourage inclusion of properties on the National Register and bring them under its protection. No federal money will be made available to any federally licensed, assisted, or financed project which may adversely affect the registered property without affording the Advisory Council a reasonable opportunity to comment; or, in the case of highways, to carry out a complete study of viable alternatives. It is important to note that under the old Section 709 HUD's Historic Preservation Program, no funds were available unless a property was also listed on the National Register.

A second major objective of the 1966 Historic Preservation Act was to distribute a portion of federal preservation funds to private owners. It was thought that federal funds, once in the hands of the states, would be distributed to communities and private owners engaged in preservation efforts. However, because of insufficient funds and for other reasons, much of the money has been absorbed at the state level to finance state or state-assisted projects.

Other Federal Programs In addition to the program established by the National Historic Preservation Act of 1966, there are approximately fourteen departments of federal agencies[84] which have important programs affecting preservation.

The Department of Housing and Urban Development (authorized by the Housing Act of 1949, as amended) formerly operated several programs significant to preservation efforts, chiefly the Open Space, Urban Beautification, and Section 709 Historic Preservation grant programs. While most of these were closed down by executive order in January 1973, a few remain available. Urban Renewal Demonstration Grants are still available for developing and testing innovative methods, including those related to preserving and restoring historic properties. Comprehensive Planning Assistance Grants are made available for projects supplementing of comprehensive plans for areas with common or related development plans. These include historic surveys, costs of rehabilitation, or any other information, except detailed plans or working drawings, related to a program of historic preservation.

The Department of Transportation under Section 2(b)(2) and 4(f) of the 1966 Transportation Act is instructed to make special efforts to preserve historic sites and structures. The Secretary of Transportation may not approve any transportation project affecting historic property of federal, state, or local interest if possible alternatives exist.

The Land and Water Conservation Fund (Public Law 88-578, 1964) provides matching funds for outdoor recreational purposes, including archaeological and historic sites.

Manifesting a current trend to implement preservation objectives through other federal programs, particularly environmental ones, the National Environmental Protection Act has also been applied to historic areas. To date, this has been held to apply with respect to historic landscapes and areas containing historic buildings. Recent attempts to include individual historic buildings are being contested in the courts.

A 1972 amendment to the Federal Surplus Property Act of 1944 makes available to local governments at no charge historic buildings which have been declared surplus. Of particular importance is that these buildings may be used by the local authority for commercial purposes.

Federal Executive Order No. 11593, February 1972, requires all federal agencies to survey all their lands and buildings and nominate appropriate ones to the National Register. The agency is then required to make postive action plans to protect all lands and buildings so listed.

While not aimed specifically at local preservation programs, it should be noted that general revenue sharing funds may be used for these purposes and have been so used in several cases. It is possible that Title IV funds may also become available.

State Programs Since passage of the 1966 Act, states have started to give historic preservation more attention and all fifty now have federally approved statewide historic preservation plans. In 1972, the Advisory Council on Historic Preservation identified and analyzed the better state laws and prepared guidelines for state legislation in an attempt to achieve generally more comprehensive and consistent programs.[85] The guidelines propose creation of state agencies which, to some extent, replicate agencies existing at the federal level.

Innovative Approaches at the Local Level

Such local innovation as can be identified has occurred mainly in those programs that are reinterpreting the philosophy, scope, and substance of historic preservation. At the cutting edge are a shift in emphasis toward environmental objectives, a more comprehensive treatment of environmental factors, and the expanded use of familiar tools.

There are three local programs which characterize much of the cutting edge in historic preservation. Two of these, in Norfolk, Virginia, and San Francisco, California, are public programs; the other, in Pittsburgh, Pennsylvania, operates primarily in the private sector.

Norfolk, Virginia, has employed a new "mini-district" zoning concept in proposing the creation of an Historic and Cultural Conservation District.[86] Similar to the "floating zone," the mini-district encompasses one or more individually significant historic structures. In essence, the mini-district is not unlike any other land-use zone,[87] but the usual regulations on size or other traditional characteristics of the historic district do not exist. Criteria and procedures for establishment are specified, as are controls with respect to lot size, design, demolition, and use. Once an area has been designated as an historic district, the proposed ordinance permits regulation designed to preserve the area's desirable and unique visual character. These include use permits, lot dimensions and size, setbacks, courts, building spacing, lot coverage, building height, off-street parking and loading, signs and exterior illumination.[88] Miner notes,

> The two-step process reflected a strategy to establish the concepts of preservation outside the debate over particular structures. The historic and cultural zoning framework was established to fit the particular preservation needs of Norfolk. It formalized the public purpose in preservation, allowed the creation of specific regulations in different districts custom tailored to their different needs, allowed the creation of transitional zones to protect the historic areas from disruptive development in visually related areas, and permitted the application of historic zoning to a single individual property if this was warranted.[89]

It remains to be seen whether the Virginia court and others which follow this approach will consider such an ordinance spot-zoning. The defense, of course, rests "...on the argument that it is not unequal, unreasonable, or arbitrary to treat historical properties differently from their unexceptional neighbor."[90] To further strengthen its legality, Norfolk requires that only the public body may petition for the rezoning and must show a purpose consistent with the comprehensive plan that is significant to its success.

This technique is noteworthy with respect to its capacity to handle hetrogeneous areas containing historic landmarks, particularly because it is integrated into an overall design plan. In this manner the plan is used to support preservation objectives, and the historic landmarks become an integrated part of the plan, the total guidance system, and the urban fabric.

San Francisco, California Conservation is part of the comprehensive plan for San Francisco,[91] providing an example of a comprehensive treatment of environmental factors and objectives. San Francisco bases its approach on the concept of providing people "...with a feeling of continuity over time, and with a sense of relief from the crowding and stress of city life and modern times..."[92] Historic preservation, in this sense, is not only considered in relation to specific historic landmarks or sites, but also includes districts of special character and natural areas, parks, the bay, and the ocean, which fulfill "...human needs for rest, quiet, escape from the city's pace and freedom from confinement."[93] These elements are considered within the scope of the preservation program because they are "...resources that change little over time."[94] In justifying this expanded scope, San Francisco's report argues, "...nearly all older buildings regardless of their historic affiliations, provide a richness of character, texture and human scale that is unlikely to be repeated often in new development."[95] These buildings should be preserved because "...they help characterize many neighborhoods of the city, and establish landmarks and focal points that contribute to the city pattern."[96] Similarly, areas with special character because of building scale, landscaping, topography, or other attributes should be preserved because they are indispensable to San Francisco's image.

The concept that the city's streets are resources to be conserved to improve the city's imagability and comprehensibility and to guide organization and scale of building development is an important innovative aspect of San Francisco's approach. In this context, historic preservation becomes an inseparable part of the broader concept of urban design. This is reflected in the principles and policies for preservation proposed by the San Francisco Planning Commission. For example:

> Preservation of San Francisco's strong and continuous downtown street facades will insure maintenance of that area's distinctive character and spatial quality. New construction can have a positive effect on the area around it if it reflects the character of adjacent older buildings of architectural merit.[97]

Although historic buildings and areas are to be conserved, the important aspect of the preservation approach is that it provides the framework and guidelines for future urban growth and renewal. This can be seen in preservation policies such as the following:

> Respect the character of older development nearby in the design of new buildings.
>
> Recognize and protect outstanding and unique areas that contribute in an extraordinary degree to San Francisco's visual form and character.[98]

The preservation program in San Francisco is part of the total urban design effort. Its end-state approach and its methodology are similar to those described earlier for urban design. In the context of historic preservation, per se, these innovations take on added significance. Their application has yet to be tested by the courts and the response to this broad interpretation will be important.

Pittsburgh, Pennsylvania Historic preservation is often criticized for failing to consider the residents of the impacted community. Older, historic quarters in cities are usually blighted and often house the poor. Preservation programs in these areas have tended to replace this population with middle and upper class residents, for example, Society Hill in Philadelphia and Georgetown in Washington, D. C. As Newsome and Stipe have pointed out, the issues involved in these circumstances are formidable, both questioning and threatening preservation efforts.

The Pittsburgh Program[99] attempts to overcome this problem with an alternative to conventional practice which incorporates a shift of emphasis in environmental objectives. This program, described by Robert Stipe, as a "recycling of old buildings,"[100] was initiated by a private conservation group, the Pittsburgh History and Landmarks Foundation. The program consists of upgrading the environmental quality of blighted neighborhoods without displacing residents.

The Foundation believes that while preservation bolsters the morale of the neighborhood, it must be accomplished without massive demolition which creates almost unworkable relocation problems.[101] Policy in the program is also based on the belief that preservation, by creating variety and diversity, provides esthetic satisfaction; it can also unify community forces since it uses fully the human resources available in the neighborhood through mutual help or decision-making processes. Financial benefits can stem from restored areas raising city tax bases or becoming tourist attractions.

When the Pittsburgh Historic and Landmarks Foundation selects a physically deteriorating neighborhood, foundation funds are used to obtain and repair houses in poor condition. Several strategies are used. Selected absentee-owned houses are acquired, significantly improved, and then rented to young middle to moderate income families, often bringing new vitality into the neighborhood. Displaced tenants are relocated in nearby homes. The foundation encourages its own members to acquire, remodel, rent, or occupy properties in the area, and property owners already living in the area are urged to stay and to repair their buildings. The objective is not always total restoration of property, but functional and exterior improvement to upgrade the total environmental quality of the neighborhood.

Another route is to nominally improve basically sound houses and rent them to low-income neighborhood residents, in effect leasing them to the Public Housing Authority. While nominal rehabilitation is only a short-term solution, the buildings can be saved and made available to those who need housing but cannot afford prevailing prices.

Since the Pittsburgh Program is based on private initiative, financing is of vital importance. A non-profit Revolving Loan Fund has been established for several neighborhoods with many valuable Victorian buildings in need of repair. Improvement loans are extended to residents unable to obtain conventional loans. In addition, a Major Development Fund was established by Action Housing, an organization primarily interested in creating good housing, not in historic preservation. A contractor unable to get conventional financing can borrow money to cover front-end costs or to finance construction of new or rehabilitated housing. Loans are not made for restoration in the accepted sense.

While it has been noted that this program is essentially in the private, housing sector, considerable emphasis is placed on strengthening and developing other municipal services and facilities. This requires public action and coordination between private and public agencies, especially in utilizing certain federal housing programs.

A particular danger inherent in the private sector approach (though frequently occurring within public programs as well) is the failure to coordinate the private effort with public policy and programs affecting the preservation or conservation target. Land economics, tax policy, land use policy, and similar aspects regulated by the public sector, significantly affect the future of historic sites and buildings. The land market, improper zoning, or an adverse real property tax structure can vitiate all efforts to protect these elements. Preservation or conservation efforts which hope for reasonably permanent solutions must anticipate the impacts of these governmental activities. Inmer has several suggestions for achieving such integration: a future outlook measure; an early bird measure, a coordination measure; a linkage measure; a tradeoff measure; and a fun and profit measure.[102] It would appear that the Joint Concept approach mentioned earlier in this chapter may have some relevance under these conditions.

Additional Innovative Local Tools

Inventory and Analysis Significant innovation continues to occur in the use of more systematic techniques for inventory and analysis.

College Hill[103] remains one of the better examples of its kind in this area.[104] The recent study of Doylestown, Pennsylvania,[105] employed the analytic technique of Jones and Jacobs[106] and used computers for graphic display of the material.

Also noteworthy in this area are the recent studies conducted in San Francisco and Newport, Rhode Island.[107] The former employed a highly sophisticated and detailed classification system and measurement techniques. The latter, in a manner commensurate with the resources of a small town, managed to achieve similar rigor. Savannah, Georgia, is another example of sound inventory which is particularly significant regarding the design control criteria emerging from the analysis.[108]

Some states have begun to develop preservation data banks. However, the Canadian national effort to inventory its resources provides perhaps the most significant innovation in the area of inventory and analysis. Aside from the impressive magnitude of the task, a highly sophisticated and systemitized inventory procedure is employed that requires minimal expertise and time and the resulting data are suitable for computer analysis and display.

Program Implementation and Guidance Tools In addition to the techniques mentioned earlier, several other new and significant efforts are emerging. One of these is the *preservation restriction*, sometimes called an "easement." Created by deed, will, or other conveyance, the preservation, or facade, restriction allows an owner to make alterations to the exterior appearance of a building, subject to approval by the local authority.

Such restrictions may be purchased or donated and, depending on state law, may be positive or negative.

> A positive easement requires affirmative action by the person giving the easement and is used as an incentive to restore an area when an owner cannot or will not make improvements to his property and/or as a tool to arrest decay in buildings, particularly, when the owner lacks funds. Positive preservation easements are not commonly used since they are not permitted in many states and are easily extinguishable in general.[109]

A negative preservation restriction is the more conventional type. It provides to the grantor the power to limit changes in the appearance of the building without seriously affecting its use.

The grantee in these cases is usually not an adjacent property owner, but a public body. Such restrictions, unless carefully drafted by skilled counsel, may have tenuous legal basis and courts may readily strike them down. While positive restrictions are preferred by many, negative restrictions are used. However even these require careful drafting.[110]

While the outright purchase of the property will best insure achievement of specific preservation goals, there are advantages to acquiring less than full fee ownership. Restrictions appear to fit better when large areas are under consideration and little money is available, since they are usually cheaper than outright purchase. Restrictions are additionally attractive because maintenance remains the responsibility of the owner; there may be little or no tax loss to the city, and there are no geographic or zoning restrictions.[111]

Use of this new preservation tool requires extreme care, and in many cases careful alterations in state enabling legislation will be required. Problems include draftsmanship, assignability, transfer or subsequent conveyance and registration. Changing conditions, enforcement, valuation of the restriction, and impact on the real estate market create additional problems.

Preservation restrictions used in Pittsburgh and Annapolis appear to be contributing significantly to the stabilization and rejuvenation of their historic areas. In this context; it should be noted that the Tax Reform Act of 1969 has played an important role as an economic incentive.

Another emerging tool, which shows great promise is the transfer of development rights.[112] Many, if not most, historic buildings fail to fill their permitted buildable volume, usually in the vertical dimension. The owner of a preservation resource sells, with the approval of the planning commission, his unused rights of development (usually air rights) to his neighbor. The latter can use this right to develop his own property at a higher density than contained in the zoning ordinance. The owner of the preservation resource is thus provided an inducement to maintain it. This tool can have serious design drawbacks, in that the development added to the surrounding area may adversely affect both the preservation resource and the urban scene.

While this tool has been received enthusiastically by preservationists, it has fared poorly to date because of inadequate analysis, questionable and burdensome administrative controls, and a suspect legal basis.[113] John J. Costonis[114] has recently proposed a refinement on this technique for Chicago in areas with concentrations of historic buildings. The plan calls for establishment of "development rights transfer districts" based on concentrations of historic landmarks. Under the Costonis scheme, the owner of a landmark transfers his unused development rights to one or more lots in the district and receives a real estate tax reduction reflecting this. The transfers would carry with them special controls on the acquiring lot to preserve the quality of the district as well as that of the landmark itself. In case the landmark owner refuses to sell his unused development rights, the city could condemn a preservation restriction and acquire the development rights. These rights would be pooled and sold by the city to help support the program.[115]

In addition to overcoming the problems of existing development rights transfer programs, Costonis' proposal offers benefits in terms of expediting land assembly in downtown areas. Further, its very nature requires that it be part of a total urban design and planning program. In the same manner, the proposal offers another promising guidance tool to insure sound development of the city as a whole.

Early in this chapter, the emergence of esthetic quality and historic preservation as important public goods was discussed. Stipe has noted that "...to judge the seriousness by which any governmental unit follows through on its announced intentions, you have to look at its tax policies."[116] Here it is important to note the implications of Title III of the proposed Environmental Tax Protection Act of 1972 as a potentially powerful guidance tool in preservation. Proposed changes in the Internal Revenue Code seek to minimize differential tax treatment between building demolition and rehabilitation and to readjust tax incentives to favor retention and restoration of historically significant buildings. They would allow deductions for scenic landscape easements, as well. If this important reform is adopted, it will stimulate retention of older structures, in general, and buildings and districts listed in the National Register, specifically, thus contributing to the quality of the urban environment.

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CHAPTER 8

PLANNING FOR RESIDUAL MANAGEMENT: NOISE AND AIR QUALITY

Page

Noise Management 346

Elements of a Comprehensive Noise Management Program 347

Methods of Problem and Solution Definition 349

Guidance Controls for Aircraft Noise 360

Guidance Instruments for Other Sources of Noise 364

Air Quality Management 368

The National Air Quality Management Program 370

Necessity for Local Air Quality Management Program 376

Local Planning for Air Quality Management 378

CHAPTER 8

PLANNING FOR RESIDUALS MANAGEMENT:
NOISE AND AIR QUALITY

"One of the major problems for environmental management stems from the use of the environment for the disposition of residuals, the 'left-overs' from production and so-called consumption activities."[1] Residuals include liquid, solid, and gaseous by-products that are not recycled into production and energy by-products such as noise and waste heat. This chapter will deal with planning for the management of noise and air-borne residuals. Water-borne residuals have been discussed in Chapter 6.

Bower points out several "facts of life" about residuals and their impact on the environment. One of these is that there are "physical, technologic, and economic interrelationships between the two major types of residuals--material and energy--and among the various forms of material residuals--gaseous, liquid, and solid. Efficient and equitable residuals-management cannot be achieved by dealing separately with individual residuals or individual environmental 'media.' Air quality management, water quality management, and solid residuals management would not be approached as separate activities."[2] For example, burning trash converts a solid waste problem into a gaseous waste problem; installing a garbage disposal unit in the kitchen sink converts a solid waste problem into a liquid waste problem.

Despite these interrelationships and their implications for the ideal approach to the residuals problem, we shall treat noise and air pollution separately. This is partially an effort at simplicity but perhaps more fundamentally it shows that even the cutting edge approaches, in practice, still treat residuals separately. Nevertheless, Bower's point is well taken, and a more comprehensive integrated approach is a desirable goal in the literature and in practice for both researchers and professionals in

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the field. Perhaps the research that best represents the "cutting edge" of a comprehensive approach to the residuals problem is being done at Resources for the Future.[3]

Noise Management

In the past, noise has been considered a health hazard in industrial environments and a nuisance in broader community environments. It was not until very recently that noise was considered integral to the concept of environmental quality.

Noise bears a close similarity to air and water pollution in that it is largely a residual of modes of consumption and production. As these modes have changed, so has the volume and character of noise present in the environment. Since the 1930's, the level of noise in the community has risen substantially and at rates which cannot continue for much longer without drastic results as has happened with air and water pollution. "Whereas noise levels sufficient to induce some degree of hearing loss were once confined mainly to factories and occupational situations, noise levels approaching such intensity and duration are today being recorded on city streets and, in some cases, in and around the home."[4] Indications that this drastic rise in noise levels has significant impact can be found in a study done on the Mebaans, who live in a remote part of the southeast Sudan. The Mebaans, who are exposed to an average community noise level of 40 dbC, showed an incredible superiority in hearing ability over urban dwellers. This superiority reaches a point where in the seventy to ninety year age group, 53 percent of the Mabaans responded to sounds that only 2 percent of the city dwellers responded to.[5]

As with other environmental residuals, there is controversy surrounding the range of effects caused by noise. A consensus of opinion indicates that there is clear evidence that exposure to noise of sufficient intensity and duration can result in temporary hearing losses, and repeated exposures can result in chronic hearing losses. It is also apparent that noise can: (1) interfere with speech communication and perception of auditory signals; (2) disturb sleep; (3) be a source of annoyance; (4) interfere with the ability to perform complicated tasks, especially disturbing those tasks that demand speech communication or response to auditory signals; and (5) adversely influence mood and disturb relaxation.[6] There is debate on further effects of noise; one authority says that exposure to noise does not increase susceptibility to disease,[7] while others assert that high levels of noise lead directly to physiological degeneration.[8]

Today's environmental noise sources can be grouped generally into those caused by aircraft, ground transportation, construction, industry, and residences. Aircraft produce by far the most intense noise, while ground transportation noise is the most prevalent.[9] Trends are worsening. Larger and noisier aircraft, almost exclusively jets, are being built; jet flight is becoming predominant and is being introduced at many smaller airports now that short-range jets are available. More and more people are living within areas affected by aircraft noise. Vehicular traffic is constantly increasing, with truck traffic increasing the fastest.[10]

Elements of a Comprehensive Noise Management Program

It is possible to delineate the elements of a comprehensive noise management program in abstract terms. The program goal would be environmental quality with respect to noise. This is significant, for it enlarges the aim of traditional industrial noise management: environmental health. In practical terms, this means that subjective human reactions, as well as actual hearing damage, will be an important component in the program.

A comprehensive noise management program may be divided into three elements: the problem definition; the problem solution; and the guidance system. If noise is defined as unwanted sound, then the first step is determining what sound is present in a given area, what is causing it, and above what level it becomes unwanted or undesirable. The second step is identification of a desirable noise environment for the area. This must be expressed on some quantitative scale; then means to bring about that desirable environment must be examined. The third step is guiding behavior so that the desirable environment is achieved. This guidance must be legal, cost-efficient in terms of other values, and effective.

Problem definition involves the use of acoustic ani social surveys and possibly laboratory experiments. The acoustic survey measures actual sould levels in an area and identifies causes. Sound levels must be measured along several dimensions: pitch, duration, intensity, and purity. The social survey identifies reactions of survey-area residents. A substitute for this could be a laboratory experiment in which the noise climate of the area in question is simulated and reactions of subjects are identified. Patterns of reactions to specific noise climates are developed by either method. Problem definition should also include correlation of the noise climate with its causes. This is necessary if we are to predict noise climates resulting from future development. For example, if the noise climate of an area near an intersection can be correlated with its traffic profile, then a future development which has that same traffic profile may be predicted to create the associated noise climate and associated human reactions.

Problem solution requires using the results of the social survey to define a desirable noise environment. In other words, it requires a definition of "desirable" in terms of human reactions to specific noise climates. This desirable environment must then be expressed in quantitative terms using one of a number of scales, thus the desirable noise environment defined quantitatively is a set of standards. The second step is identification of alterations which have to be performed on an existing or future total environment so that its associated noise environment will meet these standards. Alterations may be performed on the source, path, or receptor of noise. Costs of implementing various combinations of these alterations must also be determined. For example, sourdproofing of homes must be compared with better muffling of car engines with respect to cost, equity, and convenience.

In the third step, the guidance system must attempt to insure that desirable noise environments become reality. It accomplishes this by insuring that the alterations of the total environment necessary to meet the noise standards are implemented. For example, if better muffling is the desired alteration, and 75 dbA at fifty feet is the standard, then regulations to that effect, along with a licensing scheme for sellers of vehicles, would together constitute a guidance system. The guidance system must be legal, cost-efficient in terms of other values, and enforceable. For example, the license scheme must be constitutional, must not impose a unreasonable restriction on business procedures, and must permit enforcement by a reasonably sized staff.

A comprehensive noise management program should include all the steps listed above for all noise sources throughout the locality. Currently, there is no community implementing this idealized program. The closest attempts have been made in planning for several new airports, one existing airport (in Chicago), and for traffic noise in Peterborough, England.

Methods of Problem and Solution Definition

Noise Surveys Essential to defining the noise problem is use of a tool known as a noise survey. This survey may be understood in terms of three components: (1) actual measurement of noise levels in the environment; (2) factors which cause these noise levels; and (3) determination of human response to noise levels.

Bragdon[11] (in Philadelphia) and Goodfriend[12] (in New York) have recently conducted noise surveys. Goodfriend states that to serve as the basis for a control program, a noise survey must consider: (1) existing ambient noise levels, which serve as criteria; (2) intrusive noise levels; (3) subjective community response factors; and (4) long-range local and regional planning considerations.[13] Ambient noise is defined as a low-level, quasi-steady, slowly changing noise for which no single source is identified. Intrusive noise is super-imposed on the ambient level, as when an automobile horn is blown. Goodfriend states that a survey must take into consideration number and type of noise sources, their location, intensity, frequency, content, time-history, and frequency of occurence. These are important because community response will be a function of these sound characteristics. Goodfriend divided his study area into units, corresponding to those land use classifications under the zoning regulations which would appear to have different noise climates. In this way, information on noise levels may be more easily integrated into a land use regulatory scheme. In addition, Goodfriend developed equations which correlate noise climates to their causes, in this case, traffic patterns.

Bragdon's principles are similar, and like Goodfriend et al., Bragdon divided his survey area into sampling units and measured noise at different times of the day.[14] He measured ambient and intrusive noise levels as well as the noise levels of particular sources.

After data are gathered that describe the community noise level by area and time, human response must be measured. Relating human response to the acoustical data should yield a new interpretation of the noise problem, which should allow the planner to begin to define a desirable noise environment.

The method most suited to the needs and capabilities of a local planning agency is the social survey.

One theoretical framework for design of social noise surveys is given by Borsky,[15] who suggests that the following four factors must be considered: (1) perception or awareness of noise; (2) activities affected or interrupted; (3) annoyance or hostility resulting from interruption; (4) complaints resulting from interruption. There are two basic approaches for conducting social surveys. The first involves acknowledgement of noise as the topic of concern, whereas the second involves disguising both the topic of concern and the identity of the interviewer. Bolt, Beranek and Newman, Inc.,[16] has conducted a noise survey utilizing the first approach. This survey is relatively uncomplicated and can be administered in about nine minutes. It consists of ten elements, for example: characterization of the general neighborhood noise environment; recall of the kinds of noises usually heard in the house; ranking sources in order of conscious awareness; nature and frequency of most bothersome noise; individual attitudes about whether anything can be done to reduce noise levels and if so, what; and indication of whether the respondent thinks he is more or less sensitive to noise than other people, and the extent to which he believes noise affects his health.

Bragdon has developed a less direct method, which Borsky also suggests. With this method, reactions to noise are solicited, but not in a context that would lead the respondent to think that the exclusive subject of the interview is noise. As would be expected, this technique requires a longer period of time for each interview than does the Bolt et al. method. Borsky suggests that the interviewer not reveal himself to be part of a governmental structure, but rather from a university or general research organization, and also that the interview be introduced as an assessment of general living conditions in the area.[17] These steps protect against exaggeration or distorted information about noise.

Planning Solutions Noise survey approaches to problem definition are fairly well developed, but, the second step, developing alternative solutions from the information given by noise surveys, is much less developed and rarely observed in practice. A concern for noise has not yet become part of a larger planning process. Bragdon bemoans the lack of interest in using noise criteria in land use planning, for example, saying that "at the present time, no government agency knows, much less cares about, the number of land parcels, households, and/or people currently being affected. In the area of our study, community noise is not officially recognized as a problem needing attention by either the City of Philadelphia or Delaware County."[18]

Soroka has described several ways in which noise surveys could be utilized in planning for noise problem solutions.

1. To establish which sources at which times and at what levels are responsible for complaints in various types of neighborhoods.
2. To establish statistically ambient noise climates normally associated with and accepted in industrial, commercial, urban residential, suburban residential, and rural communities; and with communities near airports, transportation centers, and the like.
3. To provide practical bases for the establishment of workable zoning regulations and ordinances for the control of potentially noisy activities in or adjacent to various types of neighborhoods.

4. To provide logical bases for siting and acoustical design of new structures and operations being introduced into a community.

5. To anticipate the likelihood of community complaints as a result of possible changes in operations in an existing accepted facility. Such changes might include daytime operations of a plant being extended into nighttime operations, the lengthening of an airport runway, or the widening of a main artery to handle more and heavier truck traffic.[19]

But have noise surveys actually been used in these ways? There are noise control programs at the local level, but they have for the most part failed because they rest on no rational planning foundation, for example, a noise survey. "There has been no systematic attempt to regulate. A large number of the early statutory provisions are directed at highly specific nuisances, for example, the ringing of doorbells by street merchants after dark in residential areas. Broader provisions, on the other hand, are likely to be completely vague and generalized; an ordinance will prohibit, for example, any loud, raucous, or unnecessary noise. There is virtually no attempt to define prohibited noise levels or to set any other kind of quantitative standard."[20]

If there has been no systematic attempt to regulate, it is not surprising, for there has been no systematic attempt to plan, a prior step to any reasonable regulation process. Any such attempt generally should consider the problem in terms of source, path, and receptor of noise.[21] Yet the control of the path or the receptor has rarely been considered except in planning for control of noise from aircraft. A full planning methodology, including evaluation of alternate solutions, has not been used.

Existing legal controls have been directed solely at the creation of noise, not at protection of the individual, within a dwelling or elsewhere, from whatever noise is created.[22] The path and the receptor have not been duly considered in planning for control of ground transport noise, for example. This is ironic because control at the source, except for abnormally loud emissions, is, for the most part, not under local jurisdiction.[23] Most solutions available to local governments for the control of transportation noise deal with the path and the receptor. These solutions have received consideration in planning for aircraft noise but not for surface transportation. Dorn McGrath states: "Essentially all of the current literature in the practice of urban planning is silent on the subject of noise."[24] He attempts to break the silence with the following rough outline of a methodology:

> It is time to join noise generation technology with the softer science of land use planning in the context of the metropolitan area.
>
> First, the urban expressway proposals should be subjected to systematic studies of their noise effects. There is little dispute that less noise is better than more for most people in their homes, parks, and schools, even though individual tolerances may vary widely. If this is so, there is no reason why a right-of-way 'footprint of sound' should not be plotted and analyzed to determine the noise exposure potential for urban expressways and arterial street systems as part of the urban planning process. Methods of predicting highway noise in advance on the basis of predicted traffic volumes and rates in relation to community response are reported (Goodfriend, 1967). There remain to be built 2500 miles of the nation's Interstate Highway System in metropolitan areas, and innumerable arterial streets to be improved. These projects present opportunities to achieve more peace and quiet through urban highway planning, and they should not be allowed to pass.[25]

The above pertains mainly to the path of noise. McGrath also has a suggestion for dealing with the receptor. "Further research in techniques is needed, especially to determine the effects of noise on people, but land use and transport system planning now should consider cost of home insulation, as well as the social costs of community exposure, as trade-off factors in analyzing costs of noise-generating system development proposals."[26]

Peterborough Study The thrust of McGrath's criticism is that although both the noise climate near a proposed highway and human reactions to it can be fairly well predicted, these predictions are not used in highway or traffic planning. The probable social cost of the traffic noise is not weighed against the benefit derived from the highway, and measures to alleviate the noise problem are not even examined. An exception to this rule is a study done by Jonathan A. Wright on the traffic noise problem that will be generated in Orton Township, Peterborough, a new town in England.[27] Wright begins by suggesting 30-35 db(A) in bedrooms at night as the goal of the Peterborough management program. The social cost of not achieving this interior noise environment will be interference with sleep and accompanying stress and annoyance.

Wright analyzes the price of achieving this level of quiet. He points out that the normal housing facade will reduce interior noise by about 20 db(A). Thus, an exterior noise level of from 50 to 55 db(A) will be sufficient to maintain an adequate indoor noise environment. The prediction for Orton is that exterior noise levels will be about 70 db(A) in areas near major roadways, therefore, some protection will be needed. Different methods of noise abatement must be examined to see which combination reduces the exterior noise level the desired amount at the lowest cost. After this cost is determined, it must be analyzed within the context of a social welfare function to see whether it is justified. For example, Wright points out that it would be very expensive to lower the exterior noise levels from 70 db(A) to 60 db(A) by the use of barrier mounds. The mounds would have to total seven miles in length and be twelve feet high to be effective and would cost over 500,000 pounds. An alternative might be to build the barriers out of cheaper materials (brick or timber fences), but then the desired reduction in noise level would not be achieved.

Wright describes several alternative methods in addition to home insulation as mentioned by McGrath. One is shielding, which can be accomplished by placing non-residential structures along roadways to block sound that would otherwise reach residential structures. Shielding can also be accomplished by arranging a structure on a lot to reduce the noise entering it. In addition, rooms may be arranged within the house so that the bedroom is shielded. Wright maintains that shielding is relatively costless. Another method of reducing noise is using ground absorption by locating structures at a certain distance from roadways. A dissimilar method would be to step up the pace of enforcement of existing regulations pertaining to noise emissions from individual vehicles. Traffic flows could be smoothed to reduce the necessity for periods of acceleration, truck routes could be established to guide these prime noisemakers away from residences, and highways could be depressed to reduce noise transmission.

The main point about all these techniques is that they should be considered in any traffic-noise management program. Each of them should be analyzed in terms of the noise reduction provided per unit cost. It may be that after consideration of all possible combinations, the 30-35 db(A) standard will be judged prohibitively expensive to meet; but, a comprehensive consideration of the social cost of traffic noise will have been included in the decision-making process.

HUD Guidelines In the United States, HUD has begun to include the social cost of transportation noise (both ground and air) in its decisions involving location of housing it helps finance. The agency has set out an approach which aggregates the results of acoustic and social surveys so that potential residential sites may be evaluated for their exposure to transportation noise. Standards, which constitute an evaluative framework for this exposure, are provided for use by HUD and local governments. The HUD approach is published in a booklet, Noise Assessment Guidelines.[28] The procedures accept the source and path of noise as given and focus on estimating and evaluating the resulting noise environment. The site is classified according to the following criteria:[29]

> Clearly acceptable: the noise exposure is such that both the indoor and outdoor environments are pleasant.
>
> Normally acceptable: the noise exposure is great enough to be of some concern but common building constructions will make the indoor environment acceptable, even for sleeping quarters, and the outdoor environment will be reasonably pleasant for recreation and play.

> Normally unacceptable: the noise exposure is significantly more severe so that unusual and costly building constructions are necessary to ensure some tranquility indoors, and barriers must be erected between site and prominent noise sources to make the outdoor environment tolerable.
>
> Clearly unacceptable: the noise exposure is so severe that construction costs to make the indoor environment acceptable would be prohibitive and the outdoor environment would still be intolerable.

HUD procedures include a warning to check plans for future roadway changes as well as expected changes in traffic. A site that is clearly acceptable at the present might become unacceptable in the future if predicted changes occur.

Procedures for determining the noise climate do not require any technical equipment, but do require that the planner request information from other departments. For instance, he must obtain, from the local transportation director, the peak hourly traffic flow in both directions, for trucks and automobiles separately. Since noise of vehicles is a function of road gradient, smoothness of traffic-flow, mean speed, and barriers between road and site, all these factors must be examined. Formulas are given which provide site evaluations based on these factors and on the distances involved. The HUD publication contains actual worksheets and instructions with examples.

There are similar procedures for evaluating railway noise. Also included in the booklet is a very simple test to evaluate overall noise levels at a proposed housing site. In this test, the criterion is the distance from the speaker at which hearing normal speech becomes difficult. According to HUD, if the distance exceeds seventy feet, the site is clearly acceptable, between twenty-six to seventy feet, it is normally acceptable, between seven to twenty-five feet, it is normally unacceptable, and at less than seven feet, it is clearly unacceptable.

Aircraft Noise Guidelines HUD also has guidelines for evaluating site exposure to aircraft noise. Based on Noise Exposure Forecasts (NEF), which were developed by the FAA, HUD has formulated a comprehensive airport planning methodology. NEF and related schemes, such as the Community Noise Equivalent Level[30] developed by the State of California, are based on similar procedures. Flight patterns by aircraft type and frequency are determined for a given airport. The pitch, duration, and frequency of noise that will be generated are estimated, and noise level contours are drawn on a map of the airport area. The FAA has applied NEF to land use planning and come up with the following criteria:[31]

> NEF--20 to 30 (Category A): Few activities will be affected by aircraft sound although building designs for especially sound sensitive activities such as auditoriums, churches, schools, hospitals, and theaters should consider some control in areas closest to the airport. Detailed studies by qualified personnel are recommended for outdoor amphitheaters and like places of public assembly.
>
> NEF--30 to 40 (Category B): Activities where uninterrupted communications are essential should consider sound exposure in design. Generally, residential development is not considered a suitable use, although multifamily development where sound control features have been incorporated in building might be considered. Open air activities and outdoor living will be affected by aircraft sound. The construction of auditoriums, churches, schools, hospitals, theaters, and like activities should be avoided where possible.
>
> NEF--40 and greater (Category C): Land should be reserved for activities that can tolerate a high level of sound exposure such as agricultural, industrial, and commercial uses. No residential developments of any type are recommended. Sound sensitive activities, such as auditoriums, churches, schools, hospitals, theaters, and like activities, should not be constructed in this area unless no alternative location is possible. All structures should consider sound control in design.

The FAA does not consider these categories to be standards. HUD, however, has developed standards related to the NEF contours (Table 8-1) and will use them to guide housing program decisions.[32] Localities may have to take the guidelines into account if HUD financing is involved.

TABLE 8-1

HUD NOISE STANDARDS FOR LOCATIONS NEAR AIRPORTS[33]

Distance from site to the center of the area covered by the principal runways	Acceptability Category
Outside the NEF-30 contour, at the distance greater than or equal to the distance between the NEF-30 and NEF-40 contours.	Clearly acceptable
Outside the NEF-30 contour, at a distance less than the distance between the NEF-30 and NEF-40.	Normally acceptable
Between the NEF-30 and the NEF-40 contours.	Normally unacceptable
Within the NEF-40 contour	Clearly unacceptable

The Rhode Island State Planning Program, which has made Noise Exposure Forecasts, has expressed some reservations about the HUD standards:[34]

> 1. The noise exposure zones delineated by this method contain a wide range of actual noise conditions which should not be generalized into zones in this manner. This is particularly true of the 'normally acceptable' and 'normally unacceptable' zones.
>
> 2. Application of these zones to Theodore Francis Green State Airport substantially overstates the number of persons adversely affected by aircraft noise.

The Rhode Island program suggests that both the FAA criteria and the HUD standards should be considered crude estimates of aircraft noise impact. They should not be considered a substitute for measurement in the field. "Nevertheless these methods represent the best techniques available at this time, and are useful within the limitations stated, for planning at the system level."[35]

In addition to developing a site exposure methodology, HUD has developed a more comprehensive, four-step planning approach to the problem of airport noise, embracing problem definition, problem solutions and direct action instruments.[36] The first step is determination of existing and expected noise problems. The second stage is reviewing actions that have reduced or intensified the community's aircraft noise problem. Past actions are evaluated to see whether or not they have alleviated noise, which leads to examination and analysis of public complaints. A complaint profile reveals information about sources of grievances and satisfactions that cannot be ascertained by looking at the NEF. In the third stage:

> The range of land use alternatives that may be appropriate for a given airport location needs to be identified and the costs estimated for each. Among these are: a) the preservation and provision of open space; b) zoning and other land use controls; c) redevelopment; d) insulating existing buildings; e) insulating new buildings; f) purchase of noise easements. The impact of each of these measures on the growth, development and operation of the airport must be determined. Legal review of enabling legislation and court decisions affecting such local regulatory measures should be investigated, as should the authority of the airport operator to alleviate, ignore, or otherwise affect the impact of noise in the neighboring communities.[37]

The fourth stage is assessing relative usefulness and cost of alternative land use strategies. Involved in this step is assessment of the ability of the chosen land use tools to maintain the area in compatible development.

In 1971, the Northeastern Illinois Planning Commission used the above planning model in the Metropolitan Aircraft Noise Abatement Policy Study for Chicago's O'Hare International Airport. This study is extremely thorough and describes each element of the comprehensive planning approach as it pertains to O'Hare and its environs.[38] A similar approach, although not explicitly based on the HUD model, was taken in planning new airports in Kansas City,[39] Dallas-Ft. Worth,[40] and Minneapolis-St. Paul.[41] The approach is not limited to huge metropolitan airports--Raleigh-Durham, an airport of moderate size in North Carolina, has been using a variation of this planning method since 1962.[42]

In addition, NASA has published an informative hypothetical example of comprehensive airport planning methodology for noise abatement in a medium sized city.[43] The approach, while similar to HUD's, is valuable because it is described in terms of a hypothetical case study rather than in abstract terms.

Guidance Instruments for Aircraft Noise

Source Control Guidance instruments for the abatement of noise pollution from aircraft can focus on the source, path, or receptor, or a combination of these. Guidance systems focusing on the source fall into two main types: physical suppression of engine noise through technological means and control of flight operations. The first of these is completely out of the local government's power, other than its ability to exert pressure on the federal government to require quieter aircraft on a nationwide basis. The second type of guidance system is available to local government to a limited extent. For example, a municipality cannot pass a law setting a decibel limit on flight over its territory.[44] Neither can a municipality simply prohibit flight over its territory.[45] However, on the positive side, local airport authorities may route aircraft on runways which result in less noise impact than other runways. This must be accomplished within safety constraints, of course. However, as of 1966, only eighteen airports in the country were using this technique.[46] Another technique local government might use to control the source of noise is regulation of the hours of flight. Santa Monica, California, has passed an ordinance prohibiting takeoffs between 11:00 PM and 7:00 AM. This law was upheld, but there are great reservations about its general application and usefulness. First, it does not prohibit landings, nor could it legally, and it is during landing that the characteristic, annoying high-pitched whine of jet aircraft occurs.[47] Secondly, while it is arguable that local authorities possess the power to make regulations controlling the hours of flight, it is unlikely that they would long retain this power if its exercise were stringent.[48] Also, to restrict hours of flight reduces the economic viability of the airport. A more promising source-control technique is the use of monitoring devices under flight paths. In this way, local authorities may help enforce the use of FAA promulgated flight procedures for noise abatement.[49] In addition, local airports might charge landing fees for nighttime arrivals, thus providing an incentive to airlines to limit flight during the sensitive hours.[50] Local government may regulate aircraft noise while the plane is on the ground.[51]

Generally, however, the control of aircraft noise at the source is a federal prerogative, so local governments should place primary emphasis on control of the path and receptor.

Path Control Controlling the path depends on controlling the spatial arrangement of source and receptor. First among the tools for accomplishing this is zoning. Of course, this tool is not applicable to areas already occupied by noise sensitive uses. Furthermore, in zoning for airport noise factors, the traditional basis of zoning becomes reversed. Usually zoning is justified on the grounds that nuisances should be isolated from their victims, but zoning as practiced around the new Kansas City airport, for example, will operate on the theory that the victims must be excluded from the nuisance.[52] Traditional zoning permits the so-called highest uses (residential) in all zones, while restricting the lowest (heavy industry) to just one zone. However, in airport zoning the zones are not cumulative, but exclusive; residences may indeed be prohibited from certain areas. The Twin Cities, Raleigh-Durham, and Kansas City have followed this exclusive-zone scheme. Such a scheme will probably be found constitutional as long as the zoning does not result in a lowering of property value.[53] Fortunately, when land is zoned for industrial use, its value usually rises, and most of the time the land in question would be zoned industrial or commercial. Also, since land close to an airport is usually quite suitable for this kind of development, the objectives of comprehensive land use planning coincide nicely with those of noise abatement.

With zoning, there is the problem of jurisdiction. One author has gone so far as to say that "practical difficulties render compatible land use zoning of little value. In many instances, the airport operator is not the body that has authority to zone. Often times, a regional airport is located in more than one political subdivision, and zoning would require the enactment of laws by several different and not necessarily cooperative units.[54] This picture is correct but not hopeless. Solutions to jurisdictional problems take three basic forms. The first is a cooperative model. Kansas City and Clay and Platte counties have reached agreement on a unified zoning code utilizing the idea of exclusive zones. The regional planning agency has been designated as the coordinating unit along with the city development department. There will be one plan for the area around the new airport.[55] The second model is that of an airport authority without zoning power asking cities bordering the airport to agree on certain principles in their zoning ordinances. This model is illustrated in Dallas-Ft. Worth. The third model is that of a single agency at the metropolitan level having zoning power for the airport environs. The Metropolitan Council of the Twin Cities area is empowered to create a Metropolitan Development Guide and to review local plans, zoning ordinances, subdivision regulations, building codes, and official map, to see that they are in conformance with this guide. If not in conformance, the local devices may be suspended indefinitely. Furthermore, the council has authority to develop standards related to development around the new airport.[56]

The Raleigh-Durham airport situation suggests perhaps a fourth model. Here, two counties and two cities jointly own a regional airport which is operated by an airport authority; however, all zoning responsibility rests in one county. The county voluntarily incorporated provisions for exclusive airport zoning districts in its ordinances.

As far as uses appropriate for airport zones, any such list should contain items with one or more of the following characteristics:[57]

1. Land use involving few people, such as reservoirs or sewage treatment plants.
2. Uses which are inherently noisy so that aircraft noise has little additional impact, for example, a printing plant.
3. Indoor uses--commercial, industrial, institutional--which can be protected from aircraft noise by suitable soundproofing.

Direct purchase of land is another tool which focuses on the path of aircraft noise. Dallas-Ft. Worth has used this device: "Probably the most important single decision was made by the city fathers of Dallas and Ft. Worth, to purchase enough land (land bank) to defend the surrounding communities against heavy sound affliction."[58] The method used for determining amount of land needed is probably scientific enough to stand up in the courts: "The property was shaped to anticipate the use of a Boeing 320B loaded to 225,000 lbs. gross take-off weight, on a 90 degree day with no wind. These factors and this aircraft should create the most unfavorable noise condition of any aircraft on any day under any set of conditions. The theoretical operation of this aircraft established the pattern of ground sound levels..."[59] This is probably the most effective technique in abating noise pollution around new airports. There are, of course, constraints. First, there is enormous cost. Second, the required amount of undeveloped land may not exist around the airport. Third, sometimes "great pressures are brought to bear to reduce the number of acres that the airport would take into its boundaries."[60]

Eminent domain may have to be used to purchase property rights. Normally, this technique would be far too costly because it implies buying already developed or extremely valuable land. It is required mainly when a court declares a taking of land by the airport because low level flights have destroyed the potential use of the property.

Non-extension of utilities is yet another device which can be used to discourage development. This approach is being used in Minneapolis-St. Paul and Kansas City. In each situation, refusal to extend utilities is a power of the regional body.[61]

Receptor Control Controlling aircraft noise at the receptor appears to be the least desirable method because people are generally protected only while indoors. However, when noise-sensitive development is already present in noise impacted areas or cannot be prevented from entering such areas, then source, or receptor, control is all that is available. Perhaps the most sensitive technique for controlling noise impact at the source is the Building Code Noise Attenuation District,[62] where required insulation would be determined through techniques such as a noise exposure forecast. This device is probably legal.[63]

Once development of noise sensitive uses has taken place, the remedies are inadequate. Soundproofing is possible, but expensive, and does nothing at all to protect against noise when occupants are outside the home. The cost of soundproofing a home is estimated to be from 10 to 25 percent of the original cost of construction.[64] "The main problem is the allocation of costs on a rational basis among the property owner, the airport, and the community."[65] This allocation however, misses one key potential sharer of the cost--the airline passenger. The Los Angeles Department of Airports has focused on him and, in a pilot project, will attempt to levy a one dollar tax per passenger moving through the L. A. International Airport. Also, a tax is being tried per ton of cargo.[66] Congress may legislate against this approach.

Avigation easements are difficult to classify as a method for relieving noise pollution. They do nothing to enhance environmental quality per se. They merely constitute a payment of money to a resident by the airport operator in compensation for the taking of part of the resident's property through interference with his normal use of it. The amount of money rewarded is generally about the sum necessary for some degree of soundproofing.

Guidance Instruments for Other Sources of Noise

Almost all local guidance instruments for noise control--other than those for aircraft--consist of noise source ordinances. These ordinances are either subjective or objective.[67] Subjective indicates the more traditional noise ordinance which bans such things as loud and unnecessary noises. However, "there is very little enforcement of these statutes. A municipality will run an occasional campaign against horn blowing; an anti-noise ordinance may be used as the most convenient weapon against teenage dragracers or motorcyclists; but there is virtually no use of these laws in any continuing, overall attack on the problem of noise."[68] Objective indicates the type of ordinance which defines noise violations in measurable units, such as decibels, and uses technical instruments in enforcement.

The Chicago program is an example of an ordinance providing for a continuing, overall attack on noise.[69] The New York Times has called it "the most comprehensive program to curb noise of any American city."[70] The ordinance combines both subjective and objective components. One section contains prohibitions against certain types of noise-making activities such as blowing steam whistles at factories to signal the beginning of a work period, or renting, owning, or using premises for any purposes which disturb or destroy the peace of the neighborhood. This section also contains curfews.

> It shall be unlawful for any person to use any pile driver, shovel, hammer derrick, hoist tractor, roller, or other mechanical apparatus operated by fuel or electric power in building or construction operations between the hours of 9:30 p.m. and 8:00 a.m. except for work on public utilities, within 600 feet of any building used for residential or hospital purposes.[71]

The Chicago ordinance also includes an innovative scheme of regulation, which prohibits the sale within the city of Chicago of motor vehicles exceeing a certain decibel limit fifty feet from the street center line under clearly described testing procedures. There are three categories of motor vehicles: motorcycles; vehicles with a gross weight of 8,000 pounds or more; and passenger cars or any other vehicle. The limits will become stricter in 1975 and again in 1980. The manufacturer, distributor, or importer must certify in writing to the environmental commissioner that the vehiclas he sells meet the standards.

To complement the foregoing standards the ordinance also prohibits the three classes of vehicles from exceeding certain decibel limits when in operation, that is after they are sold. These limits are measured for under 35 mph and over 35 mph, again at fifty feet from the center line as established by testing procedures set out in the ordinance. This section applies to the total noise emitted from the vehicle, not just from the exhaust, and protects the city against those operators who would alter vehicles after purchase. The standards for sale and operation together comprise a systematic attempt to control transportation noise.

The same systematic attempt is made to control noise caused by construction equipment. Four kinds of construction equipment are listed, and each is assigned a decibel limit which it must not exceed at a distance of fifty feet under procedures set out in the ordinance. Again the standards become progressively stricter from the present until 1980. This section, however, aims exclusively at the seller or lessor, not at the operator.

In addition to vehicles and construction equipment, the Chicago ordinance regulates off-the-road recreation equipment such as dune-buggies and snowmobiles. There are also standards set down for boats operating within the corporate limits on Lake Michigan.

Another interesting innovation in the Chicago ordinance is its provision for performance standards relating to noise within a zoning framework. The ordinance requires that a land use within a manufacturing zone not cause a noise above a certain level at the boundaries of a residential or commercial zone. Also, the allowable noise level varies with the frequency characteristics of the sound. There are three sets of standards; each one sets the noise level which may emanate from light, medium, and heavy industrial zones, respectively, to the borders of residential and commercial zones.

Procedures for testing noise levels in the ordinance are based on dbA standards developed by the Society of Automotive Engineers that are measurable on a simple sound meter. This scale is generally recommended for use in legal criteria for noise levels because of the ease of measurement and because it conforms rather closely to the way in which the human ear hears. Chicago has also developed an innovation in enforcement. The city plans to have mobile teams cruising the city, with portable sound meters, listening for violations.[72] Hopefully, this will eliminate one of the reasons for past failures of municipal noise ordinances where noise ordinance enfircement was generally handed over to the police, for whom it is a very low-priority matter.[73] Inglewood, California, which, like Chicago, has passed a comprehensive noise ordinance with quantitative standards, has issued a report showing how the actual enforcement will take place in the field.[74]

New York City has added to its building code requiring protection from noise within structures.[75] Another New York innovation is requiring city garbage collection services to buy only equipment which will meet certain quantitative noise standards. It should be much easier for any city to enforce noise ordinances if the city's actions set a good example. Surely garbage trucks and public busses are among the most annoying noise polluters in the city. In general, certain other measures exist which might be carried out by cities to reduce noise pollution, such as screening, elevation, and depression of highways. Autobahns in West Germany are frequently screened with trees to reduce road noise emanating from the highway.[76]

As discussed earlier, land-use planning to separate noise sensitive uses from noise producing public developments has been applied mainly to airports and hardly at all to highways or railways. "The least-used tactic to date to lessen noise has been land use planning, because most of the nation's communities are locked in, at least for the time being, to archaic layouts in which noise problems were not considered."[77]

One final approach, perhaps more effective than any of the individual devices discussed above, is establishment of a separate agency whose primary responsibility is the control of noise pollution. Such agencies exist in Chicago and New York. When control is fragmented "few, if any, of the responsible agencies view noise control as a principal--or even an important mission."[78] In a separate agency, with noise control as its single mission, the problem might get the attention it deserves.

Air Quality Management

Until recently, air pollution abatement strategies focused primarily on emission control at the source through technological changes. Although source control remains an important element in any air quality management program, it has become increasingly apparent that a more fundamental redirection of urbanization processes to reflect air quality considerations is needed. The urbanization process itself must be refined to respect the inherent capacity of the air resource to assimilate a limited amount of residuals, or pollution. In order for urban and regional planners to so direct their planning efforts, especially in the areas of land use and transportation, it is necessary for them to understand the source of the urban air pollution problem, current national air pollution abatement program established by federal legislation, and urban planning and control activities which may affect air quality.

Table 8-2 shows emission of the six major air pollutants by various sources by weight. It should be noted that this is a nationwide inventory and wide variations could be expected from rural to urban areas as well as from one urban area to another. For instance, transportation (essentially the automobile) is a more predominant source of carbon monoxide, hydrocarbons, and oxides of nitrogen in many urban areas than the national estimate would indicate. An analysis of pollution tonnage, however, may be a bit misleading in that weight alone does not reflect the variation in damage potential of each pollutant. Furthermore, it is the geographic concentration of pollution sources and the ultimate dispersion of residuals that affect air quality.[79] Attempts have been made to determine the comparative damage of one pollutant to another in order to define an air pollution index.

> An air pollution index, for example, would weight a ton of sulfur oxides much more heavily than a ton of carbon monoxide, because a ton of sulfur dioxide is more damaging to health. Considerable knowledge about the effects of a pollutant is necessary to weight the elements in an index

Source	CO	Partic-ulates	SO_x	HC	NO_x
[In millions of tons per year]					
Transportation	111.0	0.7	1.0	19.5	11.7
Fuel combustion in stationary sources	.8	6.8	26.5	.6	10.0
Industrial processes	11.4	13.1	6.0	5.5	.2
Solid waste disposal	7.2	1.4	.1	2.0	.4
Miscellaneous	16.8	3.4	.3	7.1	.4
Total	147.2	25.4	33.9	34.7	22.7
Percent change 1969-70	-4.5	-7.4	0	0	+4.5

Source: Council on Environmental Quality, Environmental Quality, The Third Annual Report (Washington: U. S. Government Printing Office, 1972, p. 6.

TABLE 8-2

ESTIMATED EMISSIONS OF AIR POLLUTANTS BY WEIGHT,
NATIONWIDE, 1970 (PRELIMINARY DATA)

> accurately. In most environmental areas, further research is necessary to add to our knowledge about effects. For example, the ambient air quality standards, on which most air pollution indices are based, are still somewhat controversial, and research is underway to understand more fully the long-term health effects of air pollutants, so that the scientific basis for the standards can be improved.[80]

The National Air Quality Management Program

Although most cities have had air quality ordinances in effect for years in conjunction with public nuisance provisions applicable to the most obvious examples of pollution--smoke, soot, and odor, it was not until the 1950's that the severity of less obvious pollutants such as smog was understood. The growing recognition of air pollution problems in this country is reflected in the evolution of federal legislation beginning with the Air Pollution Control Research and Technical Assistance Act of 1955 and culminating in the recent Clean Air Amendments of 1970 (PL 91-604; 84 Stat. 1676) which established a framework for all state and local air quality management efforts. The major thrust of the 1970 Amendments was establishment of ambient air quality standards which are applicable on a nationwide basis.

National Ambient Air Quality Standards National ambient air quality standards consist of primary standards which relate to public health and secondary standards which reflect public welfare considerations. The administrator of the Environmental Protection Agency may propose primary and secondary standards for any pollutant along with appropriate air quality criteria. Interested persons are given ninety days to submit comments before final standards are established. At this time, standards for six pollutants have been determined. (Table 8-3.)

In addition to ambient air quality standards, two provisions of the amendments call for a significant interface between air quality control and the urban planning process: State air quality implementation plans and performance standards for new stationary sources.

Implementation Plans The Clear Air Amendments of 1970 mandate planning for air quality at the state level. After a standard has been promulgated by EPA, each state is given nine months to submit a plan to

Pollutant	Primary standard	Secondary standard
Sulfur oxides (sulfur dioxide)	80 g/m^3 (annual arithmetic mean)[a] 365 g/m^3 (max. 24 hr. conc.)[b]	60 g/m^3 260 g/m^3 1,300 g/m^3 (max. 3 hr.)
Particulate	75 g/m^3 (annual geometric mean) 260 g/m^3 (max. 24 hr. conc.)	60 g/m^3 150 g/m^3
Carbon monoxide	10 g/m^3 (max. 8 hr. conc.) 40 g/m^3 (max. 1 hr. conc.)	same same
Photochemical oxidents	160 g/m^3 (max. 1 hr. conc.)	same
Hydrocarbons	160 g/m^3 (max. 3 hr. conc.)[c]	same
Nitrogen dioxide	100 g/m^3 (annual arithmetic mean)	same

Source: Federal Register, Volume 36, No. 84, April 30, 1971, Part II.

TABLE 8-3

NATIONAL PRIMARY AND SECONDARY AIR QUALITY STANDARDS achieve a primary standard and up to eighteen additional months to submit a plan to attain and maintain a secondary standard. Plans are reviewed by EPA and either approved or disapproved, in whole or part, within four months of submission.

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[a] g/m^3 = micrograms per cubic meter

[b] all maximum time period concentrations not to be exceeded more than once per year.

[c] 6 - 9 a.m.

Plans that were due by January 30, 1972, were to provide for attainment, by 1975, of the primary standards for the six pollutants in Table I. Secondary standards must be achieved within a reasonable time period. An implementation plan must include the following elements:[81]

1. Emission limitations (for existing sources), schedules, and timetables for compliance with such limitations and other measures necessary to attain and maintain standards, including, but not limited to, land use and transportation controls
2. Provisions for monitoring and analyzing air quality.
3. Review, prior to construction or modification, of the location of new sources to which a standard of performance will apply and the authority to prohibit construction if it will prevent attainment or maintenance of standards.
4. Provisions for intergovernmental cooperation.
5. Assurance of adequate personnel, funding, and authority to carry out the plan.
6. Requirements for stationary source owners or operators to monitor their emissions and provide public access to such reports. (Elsewhere in the act provision for entry and inspection by public officials is made.)
7. Provision, to the extent necessary and practicable, for periodic auto emission testing to enforce compliance with emission standards.
8. Revision procedures when standards are altered or technological advances warrant a new approach to control.

Essentially the plan is to outline the "control strategy" of the state's abatement program. "'Control strategy' means a combination of measures designed to achieve the aggregate reduction of emissions necessary for attainment and maintenance of a national standard..."[82] it should be noted that this implies that a control strategy includes only measures which actually reduce the amount of emissions generated. In fact, however, a state may take two other approaches: (1) modification of residuals (emissions) after generation (for example, requiring retrofitting of in-use automobiles), and (2) better utilization of the assimilative capacity of the environment (planning location of sources to dilute their impact on air quality). These two approaches are considered proper by EPA in an expanded definition of a control strategy in the Implementation Plan Guidelines. A control strategy includes but is not limited to measures such as:[83]

1. Emission limitations.
2. Federal or state emission charges or taxes or other economic incentives or disincentives.
3. Closing or relocation of residential, commercial, or industrial facilities.
4. Changes in schedules or methods of operation of commercial or industrial facilities or transportation systems, including but not limited to, short term changes made in accordance with standby plans.
5. Periodic inspection and testing of motor vehicle emission control systems, at such time as the Administrator determines that such programs are feasible and practicable.
6. Emission control measures applicable to in-use vehicles, including but not limited to, measures such as mandatory maintenance, installation of emission control devices, and conversion to gaseous fuels.
7. Measures to reduce motor vehicle traffic, including but not limited to measures such as commuter taxes, gasoline rationing, or staggered working hours.
8. Expansion or promotion of the use of mass transportation facilities through measures such as increases in the frequency, convenience, and passenger-carrying capacity of mass transportation

systems or providing special bus lanes on major streets and highways.

9. Any land use or transportation control measure not specifically delineated herein.

10. Any variation of, or alternative to, any measure delineated herein.

Obviously, many of these measures are aimed at the reduction of pollution from automobiles. EPA quickly realized that states were unfamiliar with the use of transportation control schemes to abate air pollution, accordingly, states were given an extension until February 15, 1973 to submit portions of their implementation plans dealing with transportation.[84] Furthermore, EPA has undertaken an extensive research effort to aid states in this phase of their planning.[85]

State air quality implementation plans must provide not only for the attainment of air quality standards by 1975 but also for maintenance of air quality in subsequent years. In early 1973, after a ruling by the U. S. Court of Appeals for the District of Columbia, the administrator of EPA reexamined state implementation plans and found that: ...no state plan contained adequate growth projections for any significant period of time in the future...

> Moreover, it is recognized that maintenance of standards cannot be insured simply by projecting future growth and curtailing present emissions in order to provide opportunities for this future growth of emission sources.[86]

Although maintenance of standards is partially insured by state provisions to review the location of new stationary sources, this review did not extend to general urban and commercial development which may stimulate increased emissions from motor vehicles or stationary sources. Thus, all states are now required to include in their plans[87] a legally enforceable procedure for reviewing the impact of full construction or modification of a "complex source" and for preventing construction or modification of such sources to attain and maintain a national standard or to prevent interference with the state control strategy.

A complex source is generally defined as a facility that has or leads to secondary or adjunctive activity which emits, or may emit, a pollutant for which there is a national standard. These sources include, but are not limited to: shopping centers; sports complexes; drive-in theaters; parking lots and garages; residential, commercial, industrial, or institutional developments; amusement parks and recreational areas; highways; sewer, water, power, and gas lines; and other facilities which will result in increased emissions from motor vehicles or other stationary sources.

Final regulations for the review of complex sources, including evaluation procedures, will be published June 11, 1973.

Standards of Performance for New Stationary Sources This is the second provision of the amendments which is significantly related to the urban planning process. Although urban zoning has often included performance standards, under the 1970 Amendments, performance standards are to be promulgated on a national basis for all new stationary sources of air pollution declared by EPA to endanger public health or welfare. Performance standards have been established for the following stationary source categories: fossil fuel steam generators; incinerators; portland cement plants; nitric acid and sulfuric acid plants.[88] These performance standards automatically override any local standards.

Other Provisions The 1970 Amendments also require stringent national emission standards for new motor vehicles. Beginning in 1975, new autos must emit 90 percent less carbon monoxide and hydrocarbons than emitted by 1970 models. By 1976, emissions of oxides of nitrogen must be reduced 90 percent from the 1971 model level. These reductions must be maintained for the useful life of the vehicle, defined as five years, or 50,000 miles, whichever occurs first. The specific test procedure for determining whether this standard is achieved was not specified in the amendments but was left to the discretion of the EPA administrator. Obviously, the technique used will influence the actual definition of the 90 percent reduction.

The 90 percent reduction of emissions was determined necessary to achieve related ambient air quality standards. In some urban areas, where traffic is far greater than average, this source control approach alone will not elicit a sufficient reduction in emissions to achieve standards. Points of congestion will provoke concentration of pollutants beyond acceptable levels. The need for additional land use and transportation controls will be a function of several factors including: (1) the degree to which the auto industry can produce and market a "clean" car;[89] (2) the time period for which the car will actually remain "clean"; (3) the rate at which "clean" cars enter the vehicle population in a given area and affect total emissions generated; and (4) the accuracy of vehicle usage projections and future operating characteristics in urban areas. The sheer volume or the localization of traffic could negate much of the gain made through emission reduction at the source.

The amendments also call for setting national emission standards for those pollutants which have been determined hazardous because of their health effect, but for which there are no national air quality standards. Three pollutants have been so classified and emission standards for them have been proposed: asbestos; beryllium; and mercury.

The role of the federal government in enforcing standards was strengthened in the '70 Amendments. The administrator of EPA is authorized to enforce compliance with any aspect of a state's implementation plan. A violation may result from either individual action or state failure to enforce the plan.

Necessity for Local Air Quality Management Programs

Under the existing legislative framework, states are given the ultimate responsibility for developing air quality management programs. "But while much of the control over air quality standards has moved to governmental levels above the local level, the responsibility for actual enforcement of the standards and for translating them into emission limitations and compliance schedules is still largely delegated to the local level in many states. Thus, the role played by many local jurisdictions is still a crucial one."[90]

Even without state delegation of responsibility, local efforts in air quality management, especially through land use and transportation planning, are necessary. First, the federal air quality program is limited to those pollutants significant to most areas of the nation. Although the list of pollutants covered by national ambient air quality standards may eventually be expanded, pollutants which are significant in some parts of the country may not be included in the national abatement program. Flourides are one example.

Secondly, the federal abatement program still relies heavily on technological source control, and even if the best available technology is required by federal law on new sources and in many cases by individual states on existing sources, this may not be adequate, especially in states that have legislated non-degradation of present air quality. Emission standards determined today for a city with an expanding industrial base may be inadequate if future industrial expansion is not adequately projected, especially if the expansion occurs within a limited area. The recent federal requirement for review of "complex sources" recognizes the need to evaluate the air quality implications of major urban development, and this will be done locally.

Thirdly, source control alone fails to take advantage of the assimilative capacity of the atmosphere which offers a possibility for spreading out emissions over a given area, thereby diluting their impact. Strategically locating sources may be a least-cost alternative to source control and may not conflict with economic objectives as greatly as source control regulations. Certainly, source control must be fundamental to any abatement strategy, but its emphasis should not preclude adequate consideration of other approaches.

Fourthly, it may be important to locate some urban activities such as schools, hospitals, and homes for the elderly on sites where air pollution impact is even less than required by federal law.

The control strategies of implementation plans may include many land use and transportation planning measures. In most states, however, authority for this planning, development, and operation is delegated to local governments. If for no other reason, this decentralization of authority appears appropriate since it would not be feasible for states to adequately monitor all local activities.

Although the Clean Air Amendments of 1970 delegate responsibility for determining and implementing land use and transportation controls to the state, they do call for an assurance of intergovernmental cooperation within the state. Implementation plan guidelines allow a state to authorize a local agency to carry out a plan.[91] Where such delegation of responsibility is made by a state to a local agency, the state must identify in the plan:[92]

1. The local agencies by official title, which will participate in carrying out the plan.
2. The responsibilities of such local agencies and the responsibilities of any state governmental agency involved in carrying out any portion of the plan.

Designation of agency title and responsibility is not sufficient assurance of intergovernmental cooperation. Intrastate-intergovernmental cooperation is not an easy objective to achieve. There is the problem of identifying those local agencies best suited to implement a portion of the plan. Once appropriate local agencies are identified, there remains the problem of obtaining a commitment from them as well as the problem of providing them with the necessary legal tools for plan implementation. At the local level, authority over various development regulations and incentives is diffused among many agencies, each with its own objective, to which, at this point, a state may desire to add air quality.[93] Since the city, county, or regional planning agency is well aware of this diffusion of authority, it is perhaps best suited to work with the state agency in developing and implementing an air quality management program.

Local Planning for Air Quality Management

Since air quality objectives have only recently been added to the urban planning agenda, very few examples of such activity--comprehensive urban planning for air quality--exist. To date, aside from some attempts to modify transportation, air quality planning has been limited to problem definition and general recommendations. For example, Los Angeles included an analysis of the local air quality problem and current management efforts in its *Environmental Conservation Element of the City General Plan*.[94] Monroe County, New York has also added air quality to its comprehensive plan. Monroe County stressed the diversity in factors contributing to air pollution as well as the diversity in public agencies that must coordinate their efforts if an effective management program is to be developed and implemented. The Pikes Peak Area Council of Governments recently completed an analysis of air pollution which included an evaluation of several different urban spatial patterns as they affect air quality.[96] Local meteorology and predicted automobile trip lengths were the two primary factors differentiating various urban geometries. The relationship of air quality to land use patterns has been of special concern in new town design, and an extensive evaluation of alternative land use plans has been conducted for the Hackensack Meadowlands in New Jersey.[97] One of the most comprehensive studies of the relationship of air pollution to the urban planning process is a case study of a Los Angeles district plan recently completed by graduate students at the University of California at Los Angeles.[98]

The studies cited here emphasize the need to infuse air quality objectives into the day-to-day urban planning process. Although the guidance system planning process for air quality remains somewhat theoretical in nature, some ideas are worth exploring.

To evaluate the causal structure of air pollution in an urban area in terms of its physical characteristics, it is necessary to conduct a thorough inventory of emissions, by source, type, and quantity. This type of study has long been fundamental to all abatement programs.[99] However, urban development and functional models have seldom, if ever, been incorporated into an emissions inventory study to indicate the effect on the entire system of a change in one sector of the urban activity arena, and hence on emissions, and ultimately on air quality. For instance, a state may now evaluate the impact of a proposed highway on air quality but will often fail to look at its impact on other development in the area, thus failing to evaluate the highway's secondary impacts on growth and, hence, on air quality.

Once the causal structure has been investigated, an attempt can be made to develop the guidance system. To a certain extent, the causal structure of the pollution problem in a given city will define the scope of appropriate strategies. Legal, administrative, budgetary, political, and institutional considerations may further define the range of acceptable and effective strategies.

Guidance system components may be broadly categorized as advice, controls, inducements, and development.[100]

Advice Advice is perhaps the oldest and most frequently used type of guidance instrument. It may stem from the informal exchange of ideas and information among government departments and officials and private developers or from the more formal review requirements for permits and licensing. The transmittal of information and advice from one agency to another or to a private individual may be institutionalized by requiring environmental impact analysis as does the National Environmental Policy Act of 1969. A state may require such an analysis for all state funded development projects, and localities may require it for local public investment projects as well as for private projects of a significant size or potential environmental impact.

It is difficult to predict the effects of institutionalization of the impact statement review process. If, in fact, an impact analysis were properly conducted and the least environmentally degrading project alternative selected, such a process could, theoretically, be of great significance.

The requirement for complex source review represents the evolution of the impact statement from an advisory tool to a development control. It is unclear whether the burden of proof that a proposed development will not interfere with the maintenance of air quality standards will fall on the developer or on a public agency. In either case, this will require new expertise in evaluation capacities.

Controls The institution of development controls implies predetermination of a total development pattern which reflects air quality considerations. The current federal program tends to stress a rather piecemeal approach to air quality planning. Since air quality is only one objective to be achieved, a sounder approach would be to evaluate the air quality implications of a total development scheme to determine the most appropriate pattern and insure its implementation through a variety of controls including several types of zoning, subdivision regulations, and planned unit development codes.

Emission density regulation restricts the amount of emissions per unit of land area. "For example, a regulation could be enacted forbidding emission of more than 20 tons per day per acre of land of SO_2. Such a regulation would require that either a large emitter reduce the number of tons a day emitted or have sufficient property to reduce the emissions per acre to acceptable levels."[101] This is actually a variation of the commonly used performance standard approach to zoning.

The underlying assumption of emission density regulation is that a permitted level of emission density can be determined to allow for dilution of pollutant concentration resulting in attainment and maintenance of ambient air quality standards.

While emission density regulation may be useful in siting a new development, it is difficult and often impractical with respect to existing development. Emission density limits could serve as a "possible signal when localized pockets of individual growth may present air quality degradation problems. Local officials could use them to induce more stringent control in expected industrial clusters (e.g., industrial parks) than would be required in isolated sites under the normal point source law."[102]

Emission density regulations will have to vary in substance from one area to another given variations in meteorological conditions; however, given the proliferation of government jurisdictions within one metropolitan area (and assuming general meteorological conditions), it may be wise to establish regulations for each metropolitan area at the state level so that all local governments in the region will apply the same limitation factor. Responsibility for implementation and enforcement would then be delegated to local governments having jurisdiction over zoning and building codes.

Such regulations have a high potential impact on air quality, as cited in a recent Chicago study,[103] but the constraints on operationalizing such limitations are many. First, there is some question whether it is possible to properly determine an emission density function which will reflect air quality objectives. Second, it may be quite costly for a high-emitting activity to meet the emission density requirement. Thirdly, such a requirement may make a metropolitan area less attractive to potential industry, thus conflicting with public economic growth objectives. Finally, the success of such regulations depends on strict adherence and enforcement which requires an efficient, coordinated governmental structure, including a strong working relationship between the local air pollution agency and the planning commission which generally does not exist.

Emission density zoning is similar to emission density regulation. Land requirements for each activity class are determined according to density objectives, and average emissions are estimated for each type and size of operation. Land parcels are then zoned according to pollution capacity, which is a function of existing land uses surrounding the parcel and emissions now generated. Emission density zoning is obviously aimed at controlling future development and does not address the problem of existing concentrations of high emission activities. Insofar as controlling the impact of future development on air quality, emission density zoning may be viewed as exerting a high potential influence. The constraints on implementation are similar to those affecting emission density regulation.

In many localities, certain activities are allowed in various zone classifications subject to obtaining a special use permit. By requiring a special use permit, a local government can put more stringent and specific controls on development. For example, the special use provision could be used as a vehicle for imposing emission density limitation on a class of activities with a high potential air quality impact.

In most cases, special use provisions have been viewed as a proper extension of zoning under the police power. Such requirements, however, cannot vary too greatly from one case to another within the same activity category; they cannot be arbitrary but must stem from some established set of guidelines. Guidelines, calling for more stringent density requirements for certain high emitting activities, could be established.

The potential impact of special use zoning on air quality is difficult to estimate since the nature of the provisions and their application will vary. Once again, such provisions will apply to new activities only. The impact can be estimated as middle range in effectiveness. Since specification of special use provisions is a discretionary power of the local zoning board, there exists the possibility that local boards will be reluctant to establish such provisions on activities promising economic growth to the community.

Another variation, *air zoning*, involves complete restriction of polluting activities in certain areas. Such restricted areas could be determined according to "current ambient air quality, topography, land use, population density, and the atmospheric characteristics."[104] Air zoning may be a useful protective device for areas where air quality objectives are higher in terms of concentration standards than the national objectives. A community such as St. Petersburg with a large elderly population may desire to maintain a purer quality of the air resource than required nationally. Rather than relying on emission density regulation, zoning, or special permit approaches, a locality or a state may simply designate an entire area off-limits for a certain range of activities.

> The primary value of this approach is that such zones could be imposed at the regional level as an overlay district, without having to take all zoning powers away from the localities. This makes it much more practical to implement than regional or metropolitan zoning. It would, in most cases, require new state legislation to create both the authority and the organizational machinery to establish, evaluate, and enforce such air quality zones. In effect, this would result in the setting of subregional ambient air

> standards for critical sections of a region, except that, in this case, the standards would be attached to the authority to exercise the 'police power' as it relates to land use.[105]

Such zoning's impact on air quality would be high in those areas where restrictions were imposed, but this approach used alone fails to provide any control over development in a total area. The constraints on this approach are primarily of a sociopolitical nature: the local public or the state must be in favor of totally restricting certain types of development from designated areas.

The non-conforming use is a zoning ordinance provision which offers the possibility for controlling pollution from existing development.[106] Under such a provision, an activity continues although the zone classification of the land on which it is located is changed. As a non-conforming use, however, the activity is not allowed to expand. If the activity finds expansion necessary, it will be forced to relocate.

In some cases, a non-conforming use provision has contained an amortization clause to restrict continuance of operation to a certain time period in the future--the activity is given a set time to phase itself out and relocate. Amortization schedules have not always been sanctioned by courts, and where this technique has been approved it has been with respect to less favored activities such as junkyards, gasoline stations, and billboards. Without an amortization clause, a non-conforming use may continue operation forever unless it finds expansion necessary. Furthermore, a non-conforming use exists only when zoning is first imposed on a developed area or when zoning is reclassified. In either case, the zone classification must be made to contradict with the current use. As a means of restricting future expansion, the non-conforming use provision offers some potential for pollution control; yet, here again, a firm's argument concerning need to expand and inability to relocate without extreme economic hardship may be well received by the local zoning board.

Many zoning ordinances restrict only the highest intensity of use while allowing less intense development to occur. Thus, in a residential zone, industrial uses are prohibited, while in an industrial zone, residential use is permitted.

Protective or *exclusive use zoning* is the more narrow specification of uses allowed in a zone category rather than specification of only the highest intensity use. Protective zoning may prohibit housing and commercial development from industrial zones. At first glance, this may appear to encourage concentration of emitters, but this need not be the case. Land parcels of adequate size for industrial development could be scattered throughout the metropolitan area. Permitting only industrial development may prevent encroachment of other uses into the area, thus providing adequately sized land tracts to allow industrial location where there is enough area for pollutant dispersion. The activity would then be properly buffered and it would not adversely impact on either amenity or economic values of adjoining land uses. Such zoning requires careful planning, but if properly executed, its impact on air quality improvement could be great. Again, this technique is appropriate for future rather than existing development.

The difficulties with this approach are many. In any type of zoning, restricting use to a specific category strongly affects property value. Where the classification is broad, land cost is more flexible and responds to demand for the use most desired at the time. Such market response may be appropriate since it is difficult to predict exactly a demand for future uses. A city would not want to overzone for heavy industry thereby limiting land availability for other activities, consequently pushing up the price of this remaining land. Furthermore, if the city fails to accurately forecast its industrial demand, it may have acres of vacant land that are not producing their potential in tax revenues. This land could, of course, be rezoned to reflect demand more accurately. Still, a landowner may request rezoning to sell or use his land for an existing demand while the city may want him to wait for a return on his investment until the demand shifts to the forecasted use. A landowner could argue that this is a type of "taking" in the public interest and should be compensated. Given a limited ability to predict future demand, many cities write zoning ordinances to restrict only the most intense use of land. Since protective zoning must be based on very careful public planning, the constraints on its use are those which affect planning in general and run the gamut of economic, technological, sociopolitical, and institutional factors.

It may be important to insure that the environments of certain groups of the public, the young, old, or ill, exhibit better than average air quality, and therefore to plan especially for the location of sensitive receptors. Land uses associated with these groups, such as schools, hospitals, recreation and senior citizen centers, and nursing homes, should be located away from major emission sources.

> Where facilities within areas of poor air quality are impossible to avoid, either because they are there now or because such facilities have to be in close proximity to the neighborhood residents, improvements can perhaps be made to the site, the buildings, or the facility's operation (i.e., installing central air conditioning, scheduling outdoor activities at non-peak hours, providing landscaped buffers, etc.)[187]

Aside from the requirement of buffers along major arterials, traditional *subdivision regulations* of street width, lot size, and setback offer little opportunity for controlling land use to improve or regulate air quality. More flexible regulations allowing for *planned unit development*, *cluster subdivisions*, and *density zoning* provide an opportunity to preserve sufficient open spaces to serve as buffers and to plan a development pattern minimizing trip lengths, thus reducing auto pollution. Although most PUD's have been residential, they could include a variety of land uses...

> physically integrated by internal pedestrian systems. The air pollution abatement contribution which an MUC [multi-use center] can make is in the significant reduction in trip lengths and the reduced need for automotive travel between the contained activities

> ...Many shopping centers stimulate an intense development pattern around them but, because the surrounding land has not been planned and controlled comprehensively, they generally fail to generate the advantages of an integrated MUC.[108]

The primary constraint on use of PUD or MUC regulations appears to be institutional since successful ones require close monitoring by local planning departments.

Inducements There are three major forms of public intervention which may "induce" private development or operation to meet air quality standards: *tax policies*; *public land assembly*; and *public investment* programs.

The range of possible economic strategies via tax policies which could encourage inclusion of air quality objectives into the private decision process is extensive. Perhaps most effective would be: *effluent fees* (which should most probably be implemented on a national level to avoid state and local competition for industry by offering lower or no effluent fees);[109] *amortization acceleration* to replace older, higher polluting facilities and similarly ease the economic burden of emission limitation regulations; and *differential property taxes* to encourage location of sources in less emission-dense areas.

Public *land assembly* programs offer the possibility of making available necessary acreage to industries so that development has a greater chance to conform to emission density guidelines, regulations, or zoning, whichever may exist in the locality.

Public investments in transportation, utilities (water and sewer, especially), and other public facilities impact strongly on the entire development pattern of an urban area. Postponing or cancelling investment in areas with overly intensive development in terms of emissions may have a leveling, if not reducing, effect on economic activity and thus limit emissions. Providing public services in less concentrated areas, to the degree that development will be limited in accord with atmospheric tolerance levels, may encourage proper development.

Development Industrial parks developed by the public offer the possibilities of attracting industry by making land available and insuring that development will occur at acceptable locations and densities. Open space acquisition on a regional scale is another means available to control density and location of development and may also exert a dilution effect on pollution.

> Effective dispersion of air pollutants does occur over open space and is increased if the land is planted. By absorbing moisture and then cooling by evaporation, greenery creates a cooler, more humid surface which keeps dust and other pollutants on the surface.
>
> The location and size of open spaces are important. Wind direction, type of pollutants, etc., are all relevant. Generally the width must be much wider than the narrow buffer strips common today.[110]

The design of an effective regional open space pattern obviously will require analysis of local meteorological conditions, so there can be no single optimum spatial structure. More analysis of land use and open space configurations for air quality as well as of the impact of small buffers on pollution dispersion is needed. Finally, urban renewal offers a means to reduce congestion by eliminating small polluting industries and redesigning transportation networks in blighted areas.

These possible guidance system components have been described very generally. The assessment of their impact on air quality remains a subjective hypothesis since research into the relationship between land use and air quality is relatively limited. The few studies which have been conducted focused on land use patterns at a regional scale. For example, the Northeast Illinois Planning Commission, in one of the first comprehensive planning studies for air resource management, compared such theoretical development alternatives as a "Finger Plan," "Multi-Towns Plan," and a "Satellite Cities Plan."[111] Given the specific sources of the local air pollution problem, it may be necessary to conduct a more detailed investigation of various activity systems in the city, particularly of the transportation and industrial sectors, to identify possible guidance tools for each.

Finally, it must be remembered that control over these various guidance system components is diffused among a variety of local public agencies. Since the exact character of this diffusion and the relative strength of one agency compared to another varies from one locality to another, there is not a single best institutional arrangement for urban government that can assure achievement of air quality objectives. Federal and state governments can induce cooperation among local agencies, particularly among local air pollution control, city planning, transportation, and public works departments, by monitoring closely the programs of these agencies and exerting political and financial pressure to elicit conformance to environmental objectives.

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PART IV

SUMMARY AND RECOMMENDATIONS

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CHAPTER 9

SUMMARY

Page

Introduction 403

General Statements 404

Land Use Planning and Controls 406

  Stage I 408

Water Resource Management 413

  Planning 413

  Decision Guides 416

  Action Instruments 417

  1972 Federal Water Quality Act 419

Urban Design 419

Noise 425

Air Quality 427

The Current Mainstream in Local and Metropolitan Planning Agencies 428

Conclusion 432

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CHAPTER 9

SUMMARY

Introduction

This study is based on two important premises: (1) that urbanization and land use decisions are critical determinants of environmental quality; and (2) that local level planning and decision-making, which determine the nature of urbanization processes and land use patterns, have not yet effectively incorporated environmental quality goals. It seems evident that there is an urgent need to better understand the role that local urban government can play in our present societal commitment to improving environmental quality, particularly in defining the function and potential of land use planning and controls in achieving environmental quality goals. Thus, this study focuses on two key questions: What is the state of environmental awareness and planning practice among local governmental planning agencies? What, particularly, are the more promising approaches to overall urban environmental planning and control at the local level?

Because of the length of this report and the wide range of topics it covers, we feel that this chapter should serve not only as a summary of findings and recommendations but also as a guide to reading the report. This chapter contains a detailed summary of the report, a discussion of numerous recommendations based on findings and examples within the report, and an index to specific topics or cases treated more fully in prior chapters.

It is organized as follows:

1. General Statements about our emphasis on the local, general planning level, our guidance system approach to this planning, and the need to conduct such planning within an adequate intergovernmental framework.

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2. Findings and recommendations on land use planning, emphasizing the urban guidance system and land use planning processes.
3. Findings and recommendations on management of water-land use interfaces, particularly metropolitan and regional integration of local planning efforts.
4. Findings and recommendations on urban design, especially its emergence as a process-oriented element of comprehensive planning.
5. Findings and recommendations on two urban residuals, noise and air pollution.
6. Findings from our survey of local planning agencies.

General Statements

Although the purpose of this study was to determine what local governments and general planning agencies were doing and could do to promote environmental quality, it was obvious from the start that local efforts do not stand by themselves but are related in complex ways to metropolitan, regional, state, and federal activities. However, given time and manpower constraints, we could not examine these non-local activities in detail. On the other hand, we did not limit our study or discussions solely to the local level. For example, in the water-land use section, metropolitan and regional levels of planning and management are extensively discussed. Similarly, where federal or state institutions are significant, they are included.

The planning and management framework within which we conducted the study and which we are recommending as perhaps the best approach to promote environmental quality is the urban guidance system. This approach tends to focus on the local level, but as a broad process it is not necessarily limited to that. The urban guidance system consists of planning processes and implementation concepts that can be applied to other levels of government. Although we have concentrated on local examples and local planning agencies, our primary interest has not been the local agency itself but rather the nature of the environmental problems that must be dealt with and the planning processes and implementation tools available at the local level, including, for example, metropolitan coordinations and federal assistance.

However, a key element of the urban guidance system must be the implementation powers of local governments. These powers such as zoning ordinances, subdivision regulations, building codes, and public investments, are documented throughout the report and serve as the cornerstone for promoting urban environmental quality since they have a significant effect on day-to-day urban activities and decision-making.

On the other hand, the capacity of local planning agencies and governments to use these powers in an intelligent and rational manner to promote urban environmental quality is severely limited. In the first place, local agencies are likely to be short on both the money and expertise necessary to make environmental studies and formulate workable plans and policies to use these powers well. Second, there is the crucial question of political and economic feasibility in using local implementation tools. Local economic development pressures and political constraints are often far more powerful than any concepts of improved environmental quality. Third, there are other objectives at the local level besides environmental quality, and these objectives (for example, social concerns) may be advanced by strong local interest groups and preclude a clear and deliberate attempt to formulate multiple objective strategies in which environmental quality is "balanced" against other urban goals. Finally, environmental quality problems often cut across local jurisdictional units. Most water and air quality, land use, and even urban design problems, or issues, cover areas that are much larger than a specific local jurisdiction. These "problem areas" might be a watershed, an airshed, or a metropolitan housing market. In any case, the specific local unit is only one of many that are involved and whose activities may have to be integrated, or at least coordinated, to deal effectively with many environmental quality problems.

There is a need for some form of intergovernmental framework to take advantage of and guide the implementation powers of local government. We do not intend to define this framework here as it was not the purpose of our study to look into intergovernmental relationships. However, various elements of such a framework, such as metropolitan and

and regional coordination, state policies, plans, and acts, and federal programs, guidelines, and standards, are discussed in the report.

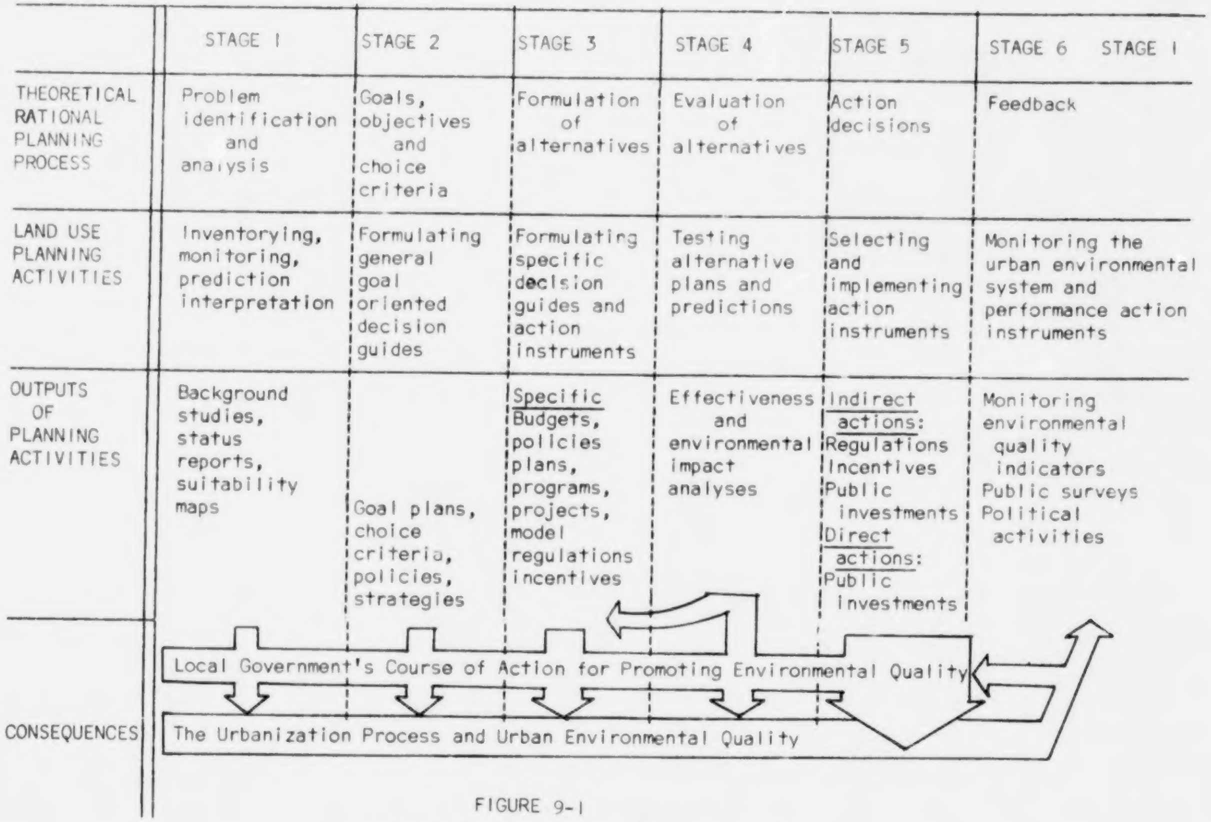
Land Use Planning and Controls

Land use planning is the cornerstone in local level planning agencies' pursuit of environmental quality. Not only is it the most traditional of the various sectors of planning discussed in this report, but it also deals most directly with the urbanization process, the underlying societal phenomenon at the root of the environmental crisis. It addresses the problem of the quantity of urban growth as well as its spatial allocation in the urban region. It also deals comprehensively with the allocation of activities in cities and with the problems of urban obsolescence and redevelopment.

A significant finding of our study, particularly in relation to land use planning and controls, is that while there are a number of examples of innovative or cutting edge approaches for achieving environmental goals, there is a great need to combine these isolated methods and tools into a single, coordinated planning process. One integrating framework, and the one we recommend, is the guidance system planning process. See Figure 9-1.

The guidance system consists of a series of planning activities and corresponding outputs that establish a rational framework for decision-making and produce various policies, plans, regulations, and incentives to guide urbanization processes toward environmental quality and other goals. The key outputs of the guidance system are the decision guides and action instruments. These outputs enable the process to extend beyond planning activities and emphasize means for implementation. The guidance system planning process is used here to organize a summary of cutting edge developments in land use planning.

The success of the guidance system approach for integrating promising planning methods and controls is dependent on the evolution of a new attitude among local planners and officials. Such an attitude would include:



1. an understanding that environmental planning must be process oriented, recognizing that urban land use and environmental systems are constantly evolving processes. Product oriented master plans and individual public projects and regulations are necessary but not sufficient to an effective land use planning and action strategy.

2. a recognition that a multitude of individual land development and political decisions made over time affect the form and function of the urban system and thereby the environmental quality of that system. Most of these decisions are in fact private, but there are points of public intervention that must be used in a systematic and coordinated fashion if their maximum impact is to be affected. Planning activity must be geared to infuse an understanding of environmental implications into these decisions.

Stage I of the Guidance System Planning Approach: Environmental Problem Identification and Analysis

The guidance system planning process begins by recognizing that the urban environment is composed of a complex set of interdependent natural and manmade elements and processes. Manmade urban systems must recognize and adapt to the natural processes of the urban environment, and planning must seek to define and promote the most productive balance between urban man and the environment on which he depends.

This recognition provides the basis for an appropriate information system for modeling and interpreting urban environmental problems. The system may be used at various stages in the planning process: for example, to monitor environmental indicators (Feedback and Monitoring, p. 158), predict future conflicts between land development and environmental processes (Problem Identification and Analysis, p. 121), suggest land use patterns from an environmental quality perspective (Natural System Inventory Analysis, p. 107), evaluate effectiveness, and assess environmental impacts (Testing Alternatives, p. 131).

To develop an adequate capacity to define environmental problems it is suggested that planners:

1. Include two fundamentally contrasting objectives for which the environmental information system is developed: first, protect urban processes from environmental hazards and second, protect critical environmental features and processes rom being disrupted by urban development. Local urban planners

have long used information systems for the former objective, usually in map form. Few have attempted to encompass both objectives, but this must be done to fully integrate manmade and natural systems.

2. Develop an informational and a data interpretation approach that will be useful at several geographic scales. It should be useful in locating potential conflicts between development and natural dynamics at the urban regional scale. Such a capacity would indicate the general location and timing of development at the regional scale. But, the information system should also be applicable to environmental planning and action at the scale of individual private and public projects, revisions in regulations, and design review processes. Such an information system suggests data and models that are more truly ecological, including attention to biological processes, energy flows, and nutrient cycles. (See Natural Systems Inventory Analysis, p. 107, and Ecosystem Analysis, p. 112.)

Stage 2: Formulation of Goals and Objectives as General Decision Guides

Comprehensive planning, particularly its land use planning component, must be redefined to include explicit attention to natural environmental quality within its multiple objective framework. There are two basic ways to do this. The most common approach is to add a new sector to the total general planning program. (See The Additive Approach, p. 98.) The other, more strongly recommended approach is a fundamental realignment of comprehensive planning where environmental quality is viewed as an integral facet of a broader concept of the "quality of life." (See Realignment of Objectives and Assumptions, p.102.)

In formulating decision guides to accomplish this redefinition of comprehensive planning it is recommended that planning agencies:

1. Continue to approach environmental land use planning with an eye to the mutiple objectives of urban society. Urban land use planning which focuses entirely on the objective of preservation of pristine natural areas is as mis-directed as that which focuses entirely on minimizing journey time from residential to work areas. The necessity to plan land use within the context of multiple objectives cannot be overemphasized at this time when environmental concerns are presently riding the public opinion tidal wave.

2. Seek ways to involve the public in a continuous dialogue on community goals and means. Although much environmental planning in the near future will be characterized by attempts to achieve goals established at the national level in terms of standards, it will most likely be the responsibility of local planners to relay to the public information on the long-term impact of local urbanization on the local environment. Status reports on environmental quality should be circulated to the public at large as well as to public officials via the media, and feedback from the public should be solicited through surveys, public meetings, and representative citizen advisory groups. (See Realignment of Objectives and Assumptions, p. 98, and Feedback and Monitoring, p. 158.)

3. Formulate land use plans having an explicit environmental base of information and goals, where land use allocation is based, among other things, on land capability, compatibility of land use to land as well as land use to land use, and an assessment of potential adverse environmental consequences. These criteria are in turn based on surficial geology, current levels of air, water and noise pollution, hydrology, vegetation, wildlife and physiographic features such as surface water marshes, flood plains, aquifer recharge areas, and slopes. (See Formulation of Decision Guides, p. 124.)

4. Formulate separate policy plans for a range of environmental problems and areas which suggest some variation in strategy. For example, remedial action or redevelopment areas might be delineated and applied to both manmade urban environment and urban infrastructure investments to restore ecological equilibrium. These areas might be distinguished from resource preservation or protection areas. In another approach, area classifications might be based primarily on the basis of differences in development pressures, again suggesting variation in guidance strategies. One recommended classification scheme consists of urban built-up areas, developing areas (where growth pressures are intense), and holding areas where much of the land is in non-urban use and development pressures are not so intense. Critical resource protection areas, which cut across these three categories, might constitute a fourth type of district. (See Generation of Specific Policy and Action Instruments, p. 130.)

Stage 3: Formulating Specific Alternative Decision Guides and Action Instruments

General goals, and policies, and strategies must be converted to specific action proposals in order to take on real meaning as a part of the government's course of action. Often, alternative specific proposals are discussed within the planning agency, but rarely are they formally published or presented to the decision-making body as a range of alternatives. In the guidance system planning process, however, these alternative actions would be discussed openly with and among decisionmakers and the evaluation criteria on which a final decision was based would be made explicit. One way to do this, though admittedly difficult in practice, would be to involve decisionmakers in the specification and ranking of objectives to be pursued by a given plan, policy, project, or regulation. (See Evaluating Effectiveness, p. 132, and Feedback and Monitoring, p. 158.)

The guidance system planning process also stresses an integrated approach to specific action proposals. Single instruments are considered part of an integrated system of regulations, incentives, and public investments. Combinations of action instruments are proposed as packages. The concept to be stressed here is that an action proposal is not limited to a single instrument. Every proposal must be considered as part of an incremental change in the context of an already existing course of action or as part of a more comprehensive proposal of changes. Each component is designed to complement the effect of other action instruments and to reinforce, not contradict, them. (See Coordination of Several Action Instruments, p. 152.)

Stage 4: Testing of Alternative Specific Decision Guides, Action Instruments and Predictions

The fourth stage in guidance system planning is testing alternatives. The alternative may be a specific plan, policy, program, or other specific decision guide of local government; it may be an action instrument or a set of such instruments, proposed or existing; it may be a forecast based on trends or the introduction of a private or higher level governmental action into the local urbanization process, for example, location of a large new industry.

In practice, alternatives may be tested for two purposes though in theory they merge. The first is determining the general effectiveness of the proposal in achieving primary objectives (see Evaluating Effectiveness, p. 132), while the second is determining the environmental impact of the proposed action. (See Evaluation on Environmental Impact, p. 135.) This latter purpose is relevant to testing private development proposals as well as public plans or projects not primarily aimed at environmental quality goals, such as alternative highway routings.

Stage 5: Selecting and Implementing Action Instruments

The fifth stage of guidance system planning involves a choice among alternative action instruments. Choice is also applicable to general and specific decision guides. Nevertheless, a basic premise of the guidance system approach is that planning must eventually come to implementation of action instruments if, in fact, environmental quality is to be affected. The community choice of a combination of action instruments is perhaps the most crucial stage in the process.

Action instruments being considered should include both the direct and the indirect. Direct action instruments to achieve environmental quality goals through land use planning are those public investments, such as sewer systems, water supply systems, transportation systems, acquisition of open space, and acquisition of cultural resource areas or structures, which impact directly on the environment. Indirect action instruments are those regulations and incentives, such as zoning, subdivisions and building codes, and taxation policies, that establish a framework of rules and conditions for private and public development. Many public investments exert both a direct effect on environmental quality and an indirect effect by providing the conditions which encourage urban development. Most action instruments available to local governments for promoting environmental quality by affecting land use are simply reassessments of rather traditional guidance instruments resulting in their modification, expansion, redirection, or more intensive application.

Action instruments recommended for consideration in controlling location and timing of development for environmental goals are exclusive agricultural and conservation zoning, historic district zoning, taxation policies closely related to special district zoning, and, potentially, public investments. Development district zoning or development timing ordinances should be considered as mechanisms for coordinating regulations, taxation, and public investments to control location and timing of development. (See Control of the Spatial Location and Timing of Development, p. 139.)

Action instruments recommended for controlling the spatial design characteristics of development at the site include density zoning, planned unit development, cluster zoning, inclusion of critical environmental provision in zoning, subdivision, building and health ordinances, special use permits for construction in environmentally sensitive areas or for types of development with a high impact potential; and the requirement of environmental impact analysis on proposed development as a prerequisite to the granting of a rezoning, subdivision plot approval, or building permit. (See Control of Spatial Design Characteristics at the Site, p. 155.)

We recommend an emphasis on the formulation of a guidance system planning approach by local and metropolitan planning agencies. The rapidity and ingenuity with which local planners have responded to the rather recent emphasis on a quality urban environment may indicate that specific innovations will become standard, if not dated, practice in future years. However, the guidance system concept may provide the mechanism to coordinate newly evolving planning methods, decision guides, and action instruments for effective environmental guidance.

Water Resource Management

Planning

From looking at the water-land use interface at both macro and micro scales as well as in terms of developing versus developed areas, it is quite evident that the key to successful urban water resource management is metropolitan-wide coordination and planning. Some of the best examples of what we call "cutting edge" planning and management are those of metropolitan-oriented agencies, for example, the Southeastern Wisconsin Regional Planning Commission, the Northeastern Illinois Planning Commission, and the Twin Cities Metropolitan Council. (See Watersheds, p. 182.)

Floodplains, p. 205, Water Quality Management, p. 231, and Metropolitan Integration, p. 252.)

Metropolitan-wide communication and coordination are necessary to integrate both jurisdictional and functional elements of urban water resource systems. Such integration is crucial at the planning level in order to relate water resource objectives and alternatives to those of other sectors such as land use and economic development, to eliminate adverse external effects created by overlapping of fragmented local systems, and to generally create more efficient water resource management. (See Metropolitan Integration, p. 247.)

Although metropolitan water resource planning and management has yet to be completely realized in practice, it has been conceptualized in some detail. At least six criteria or prescriptions can be related to such planning and management:

1. It must be directed toward meeting multiple objectives based on the needs of the local jurisdictions and the region as a whole. (See Introduction, p.176, Watersheds, p.182, Shorelands, p. 189, Urban Waterfronts, p. 244, and Metropolitan Integration, p. 251.)

2. It must consider and evaluate a wide range of alternative courses of action, both structural and non-structural, and, where feasible, use multiple purpose projects and flexible measures. (See Floodplains, p. 205, Water Quality Management, p. 225, Storm Water Drainage, p. 237, and Metropolitan Integration, p. 252.)

3. It must coordinate public and private actions, particularly to encourage private input into the formulation of objectives and the evaluation of proposed alternatives. (See Watersheds, p. 182, Estuaries and Wetlands, p. 196, Water Quality Management, p. 231, Urban Waterfronts, p. 244, and Metropolitan Integration, p. 256.)

4. It must conduct monitoring and research programs to increase its ability to understand and to be constantly aware of the nature of water-land use relationships. (See Watersheds, p.183, Shorelands, p. 188, 189, Estuaries and Wetlands, p. 196, Floodplains, p. 205, Water Quality Management, p. 228, Storm Water Drainage, p. 236, and Metropolitan Integration, p. 257.)

5. It must integrate water resource planning into the total metropolitan planning process at not only the metropolitan level but also at the local agency level. (See Introduction, p. 177, Watersheds, p.182, Shorelands, p. 190, Estuaries and Wetlands,

p. 198, Floodplains, p. 207, Water Quality Management, p. 225, Storm Water Drainage, p. 237, and Metropolitan Integration, p. 259.)

6. It must establish a framework for metropolitan-wide coordination of all local and regional (including state and federal) agencies involved in water resource management and related land use functions. (See Metropolitan Integration, p. 261.)

In addition to these criteria, there are some important concepts and trends that either cut across some of the criteria or are inherent in them. These concepts have developed fairly strong roots in the 1960's, at least in theory, and will be important forces in urban water resource management in the 1970's. First, river basin or regional water resource planning is becoming more sensitive to environmental problems and more urban oriented. The emphasis is slowly turning from large-scale flood control and economic development projects to urban problems and demands, such as water quality control, recreation and aesthetic demands, and the urbanization of watersheds and wetlands. (See Watersheds, p.182, Estuaries and Wetlands, p. 196, 198, and Floodplains, p. 205, 207.)

Second, urban or municipal water resource planning is slowly broadening its focus to consider relationships not only among water resource functions, such as water supply, wastewater disposal, and storm water drainage, but also among water-related sectors such as recreation, open space, land use, and transportation. This widening of the scope of water resource planning and management is moving much more rapidly among planning agencies than among traditional municipal departments, but it is a trend that will continue to grow in the 1970's. (See Water Quality Management, p. 225, Storm Water Drainage, p. 237, and Urban Waterfronts, p. 242.)

Third, there is an interest among water resource planning agencies, particularly at the metropolitan level, in changing their emphasis from designing specific water resource plans to formulating water resource management strategies consisting of flexible packages of policies and alternative courses of action. This strategy is closely related to the urban guidance system approach as it uses a wide range of tools for implementation and stresses relationships to land use planning.

It is particularly appropriate in complex metropolitan areas where urban growth, demands, and political cooperation are highly uncertain. (See Floodplains, p. 205, Water Quality Management, p. 225, and Metropolitan Integration, p. 252, 259.)

Finally, there is a trend toward a more open and clear planning process. This is related to the A-95 review procedures and the environmental impact statements required by NEPA, but also includes the use of advisory committees and public workshops to help formulate objectives and evaluate alternatives, the specification of criteria and standards for plan formulation, the collection and publication of key environmental data, and the presentation of alternatives accompanied by statements of costs, benefits, and intangible factors. (See Watersheds, p. 182, 183, Shorelands, p. 188, 190, Estuaries and Wetlands, p. 196, 198, Water Quality Management, p. 225, Urban Waterfronts, p. 244, and Metropolitan Integration, p. 256.)

Decision Guides

A key element in the implementation of metropolitan planning and coordination is the use of decision guides. These guides can take several forms, but, in general, they establish a framework within which public and private action can be more closely coordinated and better informed. Some decision guides useful for urban water resource management are:

1. Development guideline reports Such reports define and explain the problems likely to occur in critical areas, set forth development principles and standards, present data on key environmental factors (soils, vegetation, hydrology, geology), offer some alternative plans for development and even some specific project designs, and propose model ordinances. (See Watersheds, p. 182, 184, Shorelands, p. 190, 191, Estuaries and Wetlands, p. 198, and Floodplains, p. 207.)

2. Strategy plans These plans and statements are less detailed than development guides, but they offer a wide range of usually quite imaginative design alternatives and courses of action. They often emphasize institutional arrangements, non-structural alternatives and measures, and flexible, multiple-purpose projects. They generally do not recommend a particular project or policy but offer examples of prototype projects and

combinations of policies and projects. (See Water Quality Management, p. 225, Storm Water Drainage, p. 237, Urban Waterfronts, p. 242, and Metropolitan Integration, p. 252.)

3. Policy Statements On the basis of planning efforts (criteria formulation, data collection and analysis), governments or governmental agencies can make public policy statements in an attempt to influence public and private decision-making. The policies may be general and include broad issues such as the conflict between environmental quality and economic development, or they may be more specific such as discussing the timing and location of utility extensions. Policy statements generally have more effect at the more specific levels, particularly if the policy-making body has some degree of legislative authority. (See Shorelands, p. 189, 190, Estuaries and Wetlands, p. 196, and Water Quality Management, p. 231.)

4. Environmental information This decision guide includes many forms of information ranging from an "environmental information directory" to the simple public delineation of a wetland or floodplain area. This information acts as a decision guide solely through public awareness rather than through any interpretation or policy-making by a planning agency. (See Shorelands, p. 190, Floodplains, p. 205, and Metropolitan Integration, p. 256.)

Action Instruments

Although metropolitan-wide planning and coordination is necessary for successful urban water resource management, the key to the implementation of such planning generally lies at the local government level and at the state level in terms of what the state enables or requires local governments to do. Many of the action instruments at the local level have existed, or have been advocated, for a long time, but now with the trend toward greater environmental concern and more informed and comprehensive planning, they are on the verge of much more widespread and meaningful use. Some of the more promising action instruments are:

Indirect

1. Permit systems to control change or development of sensitive areas, such as wetlands and shorelands. (See Estuaries and Wetlands, p. 196, 199.)

2. Floodplain zoning, or special floodplain regulations within regular zoning ordinances, to restrict permissible land uses. (See Floodplains, p. 207, 208.)

3. Effluent charges, particularly on industries, to help pay the cost of municipal treatment but also to encourage better production processes and waste recovery. (See Water Quality Management, p. 229.)

4. Utility extensions to control location and timing of urban development to avoid environmentally critical areas and to create efficient utility systems. (See Water Quality Management, p. 231.)

5. Taxes to discourage development in critical areas (floodplains) or conversely, to encourage conservation of environmentally significant areas (forests). (See Watersheds, p. 184, and Floodplains, p. 207.)

6. Conservation easements on floodplains, woodlands, steep slopes, and the like to restrict building and other activities. (See Watersheds, p. 184.)

7. State and/or local moratoriums on further urban development until more data are collected and a planning program completed. (See Estuaries and Wetlands, p. 199.)

8. Comprehensive local ordinances including zoning, building, and sanitary ordinances--if local governments do not enact these in critical areas, the states could require them to do so. (See Shorelands, p. 191.)

9. On-site storm water detention requirements to alleviate downstream flooding problems and limit combined sewer overflows. (See Storm Water Drainage, p. 237, and Watersheds, p. 184.)

Direct

1. Integrated utility systems and metropolitan or regional service agencies to improve waste disposal and water supply functions and limit adverse environmental externalities. (See Water Quality Management, p. 227, and Metropolitan Integration, p. 261.)

2. Blue-green development and dual drainage systems to integrate storm water drainage and land use planning rather than to solely rely on conventional engineering solutions. (See Storm Water Drainage, p. 237.)

3. Wastewater reclamation to control water quality but also to use water supplies more efficiently. (See Water Quality Management, p. 225, 228.)

4. Low-flow augmentation and wastewater diversions to change the timing and location of wastewater flows and better use the

assimilative capacity of the environment. (See Estuaries and Wetlands, p. 196, and Metropolitan Integration, p. 252.)

5. Planned community developments and major urban redevelopments to effectively use land for urban development without causing adverse environmental effects. (See Shorelands, p. 191, and Urban Waterfronts, p. 246.)

1972 Federal Water Quality Act

Although federal water resources and water quality programs have been inherent in some of the above statements, the general nature of the federal program for the future should be noted here. With the passage of the Federal Water Pollution Control Act Amendments of 1972, the federal efforts in water quality management have been greatly expanded. The amendments extend the Act of 1965 via new and stricter standards, more money for treatment plant construction, authority for states to establish a permit program for activities that discharge wastes, and better enforcement procedures. Perhaps two of the most significant provisions are the goal of zero discharge of pollutants for industries by 1985 and the precondition for treatment plant grants that a study be made of alternative treatment techniques and recycling potentials. Neither provision may be effective in practice in the near future, but both stand as an indication of the direction of water quality management. (See Watersheds, p. 184, Water Quality Management, p. 225, 229, and Metropolitan Integration, p. 258.)

Urban Design

Significant changes have occurred in the past decade in the scope, substance, and practice of urban design and the manner in which it addressed the problems of the visual quality of the environment. Contextual alterations precipitated many of these changes. The esthetic quality of the environment, earlier considered as a need of the socially elite, became perceived as a societal need. Emphasis shifted from design as a private sector good for the few to that of a public sector good to be promoted by government for all Americans. At the same time, the designers' formal concept of esthetics expanded to embrace cognitive and behavioral dimensions and the courts furthered the legitimacy of esthetics as a justification for exercising the police power. While the incapacity to define esthetics continued to constrain its promotion by government, agreement was reached as to the esthetic merits of amenities, natural resources and historic sites, buildings and districts. (See Major Changes, pp. 281-284.)

The public commitment to comprehensive visual quality demanded active citizen participation in the design process and the explicit consideration and articulation of esthetic values, principles, and criteria. As a result, the traditional designer--client relationship began to disintegrate as did the nature of the design process. The public became an active participant in the design process, challenging the role of the designer as the esthetic expert, and the design process itself moved toward greater reliance on scientific methodology and general systemization. (See Major Changes, pp. 284-285, 289-291.)

The above contextual changes together with an awareness of the limited success of the traditional project approach to urban design or to promote the visual quality of the city as a whole resulted in a second major change. Designers shifted their emphasis from the design of specific large scale building projects to one of developing processes and guidance tools by which the total urban fabric could be improved. As a corollary, emphasis also changed from a primary concern with design at the city district level to design at the city-wide level as well. (See Major Changes, pp. 285-289.)

Finally, the process orientation and the broad social concerns required that urban design be closely integrated with comprehensive urban planning and that it include an overall design framework and guidance system for implementation. (See Major Changes, p. 291.)

The limitations of federal urban renewal, the incapacity of cities to implement redevelopment or achieve satisfactory visual quality, and the inherent limits of the private sector to provide visual quality for the general public vitiated the project approach to urban design. Urban renewal lacked geographic scope and the capacity to follow through (federal support was disappearing in any case), and the public sector lacked the funds and the political support. The private sector lacked the regulatory powers, access to federal programs, and the capacity to coordinate development. (See Urban Renewal, pp. 291-295.)

A joint concept approach to project design emerged, involving both the public and private sectors, which attempted to overcome the individual limitations of each while at the same time achieving synergistic benefits with respect to implementation, land use, and economics. (See Joint Concept Strategy, pp. 295-298.)

Probably the most fundamental change in improving visual quality occurred with respect to the emergence of the process orientation to urban design. Two basic models have been employed, one independent of comprehensive planning studies and programs and the other integrated into these activities. While the latter offers significant advantages, they both embody the same basic components or phases. (See The Process Approach, pp. 298-299.)

Phase one includes the inventory and analysis of the relevant attributes of the environment. It includes such elements as building mass, open space, historic buildings and sites, views, neighborhood boundaries, micro-climate conditions, and city images. This phase is characterized methodologically by the use of systematic and objective tools of inventory and analysis. (See The Process Approach, pp. 299-302.)

Phase two is concerned with the formulation of goals and objectives, defining the future form and quality of the environment. Emphasis is placed on obtaining citizen input via advisory committees, public hearings, surveys, neighborhood meetings, workshops and public exhibitions and on programs of public education to improve the quality of public participation. (See The Process Approach, pp. 303-304.)

Phase three is directed to defining the design principles which are used to translate goals and objectives into design plans and policies. They are formulated in relation to the goals and the objectives and/or the functions or districts to which they apply. They are not project specific but are meant to be explicit but flexible guidelines for development and review. (See The Process Approach, p. 304.)

Phase four, using the results of the three preceding phases, focuses on the development of design policy and framework plans which form the basis for guiding and promoting visual quality. These can be one element of a comprehensive city plan (e.g. San Francisco), a background report for a comprehensive plan (e.g. Los Angeles), or a plan for a specific district (e.g. San Francisco Northern Waterfront Plan). In addition, design policy plans are often produced in response to topical problems and issues or to functional elements. (See The Process Approach, pp. 304-308.)

The implementation of urban design plans and programs relies largely on the same basic guidance tools that have been used to a limited extent since the late 1950's. The emphasis has not been on developing new, unique tools but on broadening the scope of the existing tools, increasing their capacity to deal with unique conditions, providing additional flexibility both to the local authority and the designers, and applying them as a more coordinated and systematic guidance system within an overall design framework. (See Implementing Urban Design Objectives, pp. 309-309, 312-314.)

In addition to capital improvements, implementation tools are of three basic types: (1) element-specific ordinances; (2) review processes; and (3) informal influence. While combinations of these are almost always employed, their full potential is often not realized. In fact, they are frequently counter productive. Similarly, only in a few instances is their full potential obtained by designing them as an integrated guidance system. (See Implementing Urban Design Objectives, p. 310, pp. 312-314, and Innovative Guidance Techniques, p. 314.)

The first category includes zoning and subdivision ordinances, density and bulk controls, visual nuisance regulations, etc. These controls are more predictable in their results than the others but tend to be rigid and incapable of dealing with atypical conditions. They tend to eliminate the worst conditions, and in some cases excellent design, rather than promote the general quality of the environment. Unfortunately, visual quality objectives are often not considered and they produce dysfunctional results. (See Implementing Urban Design Objectives, pp. 309-310, and Innovative Guidance Techniques, pp. 314-317.)

The second category, review processes, include regulatory review procedures such as site plan review, architectural control, special uses, variances, etc. Because of their lack of specificity, considerable flexibility is provided both the authority and the designer to generate more desriable solutions and deal with unique situations. In addition, they provide the authority a broader scope and degree of control than does the above type. For these reasons, this type of control is becoming increasingly popular and has been the subject of greatest innovation. (See Implementing Urban Design Objectives, p. 310, Innovative Guidance Techniques, pp. 317-321, and Additional Innovative Local Tools, pp. 332-333.)

The third type of guidance instrument, informal influence, is usually thought of in terms of advice. But it also includes that influence which is brought to bear through remuneration, implicit threat of sanctions, harrassments such as delay, and personal charisma. Potentially, it is probably the most pervasive form of control in that it can occur at every contact between the authority and the builder or designer. Since it operates outside of the context of the police power, it provides great flexibility and scope. While informal influence can be and is abused, it provides a powerful source of guidance, particularly as planners improve their methods, design framework plans and policies, and make more effective use of remunerative sources. (See Implementing Urban Design Objectives, pp. 310-311.)

The justifications for historic preservation expanded significantly in the past decade, aligning these activities to a greater degree with general urban design pursuits and objectives and increasing the scope of elements of concern. (See Historic Preservation, pp. 321-322.) Changes in the context of preservation occurred similar to that for urban design in general and with many of the same implications. Local as well as national historic sites, buildings, structures, etc., were viewed as public goods, citizen participation increased, and elements of local value, sometimes because they were meaningful to the total urban fabric, achieved significance. (See Contextual Changes in ..., p. 322.)

The National Historic Preservation Act of 1966 played a strong role in influencing and reflecting these changes. A variety of federal programs were integrated and considerably more responsibility was placed upon the states. In addition to providing federal funds for state and local use, the Act emphasized and encouraged local participation and the preservation and conservation of elements of purely local value. (See Contextual Changes ..., pp. 323-324.)

In addition to the above Act, fourteen other federal agencies have programs significant to historic preservation and conservation. (See Contextual Changes ..., pp. 324-325.)

Innovation at the local level is characterized by the activities in several cities. Norfolk, Virginia has created a new "mini-district" ordinance, which permits the application of historic zoning to a wide variety of conditions and to achieve a variety of objectives. (See Innovative Approaches at the Local Level, pp. 326-327.) Conservation rather than preservation is emphasized in San Francisco and was approached as an integrated part of a comprehensive urban design program, substantively as well as methodologically. In addition to the conventional objectives, the program attempts to use all old buildings and districts as principal ingredients in the urban fabric to achieve temporal continuity and variety, richness of texture, character and scale, and strong imagability. Districts of special character and natural elements are also included. (See Innovative Approaches at the Local Level, pp. 327-328.) In the Pittsburgh program, conservation rather than preservation is also emphasized in historic residential areas as a means of upgrading. Unique, in this case, is the attempt to minimize relocation of local residents, while simultaneously strengthening its social and economic vitality by bringing in new residents. While this is primarily a private sector housing program, it is coordinated with community improvements provided by the public sector. (See Innovative Approaches at the Local Level, pp. 328-330.)

In addition to these innovations, other noteworthy developments have emerged. In the area of inventory and analysis methodology, several notable improvements have been developed. (See Additional Innovative Local

Tools, pp. 330-331.) In the area of program implementation and guidance the following tools are recent innovations: preservation restrictions, sometimes referred to as facade easements (See Additional Innovative Local Tools, pp. 331-332); development rights transfers (See Additional Innovative Local Tools, pp. 332-333); and the Environmental Tax Protection Act of 1972. (See Additional Innovative Local Tools, pp. 333-334.)

Noise

Our overriding conclusion regarding noise residuals in urban areas is that most local governments and agencies either have not seriously addressed the problem or have been unable to deal with it effectively. This is partly true because the most obvious urban noise, aircraft, is not susceptible to local control. Although local governments can zone areas and buy land near airports, they have little or no control over the source of the noise and therefore can formulate only limited solutions. (See Methods for Problem and Solution Definition, p. 349, and Guidance Systems, p. 360.)

However, in the realm of other urban noise (ground transportation, industry, and construction) where local governments could control the source, the path, and the receptors and formulate comprehensive noise management programs, there has been almost no activity. In particular, local agencies rarely enforce their source control ordinances, and do not consider in their land use or transportation planning the very important relationships between the source of the noise and the path and receptor of the noise. (See Methods for Problem and Solution Definition, p. 349, Guidance Systems, p. 364, and Elements of a Comprehensive Noise Management Program, p. 347.)

Although present applications of promising planning approaches dealing with urban noise are limited, or quite simplistic, basic concepts and strategies are beginning to materialize and should be useful in the 1970's. Some of these are:

1. Noise surveys Such surveys measure noise levels, locate noise sources, and determine human responses; they serve as a basis for formulating planning solutions, such as noise regulations

in a zoning ordinance or acoustical designs. (See Methods for Problem and Solution Definition, p. 349.)

2. Cost analyses These studies look at various alternative measures (insulation, shielding) to obtain desired noise levels at specific locations and the costs associated with the measures. These are the only objective monetary analyses available because damage and benefit functions are unavailable. (See Methods for Problem and Solution Definition, p. 353.)

3. Noise exposure forecasts Based on projected flight patterns or transportation flows, these can be illustrated as contour levels of noise, which can then be related to land use planning, zoning, and building regulations around airports or highways. (See Methods for Problem and Solution Definition, p. 355.)

The value of the following guidance tools for noise management depends on a firm base of comprehensive planning approaches as suggested above and their enforcement, preferably by a separate municipal noise agency with mobile meter units.

1. Zoning This is often used to keep residential areas away from airports or other noise sources but could also be used to keep noise sources out of "protected areas." (See Guidance Systems, p. 361.)

2. Land acquisition and avigation easements These are used to prevent sensitive receptors from locating near noise sources or to compensate the receptors for bearing the noise. They may become prohibitively expensive. (See Guidance Systems, p. 361.)

3. Ordinances These may include restrictions on automobiles, construction, and industry. They may take the form of performance standards for industrial zones, building codes, timing of construction, or automobile standards. (See Guidance Systems, p. 364.)

4. Screens, barriers, depressions Such devices alter the physical path between noise source and receptors and may be useful in developed areas but would be unnecessary if sources and receptors were properly located via sound land use planning. (See Guidance Systems, p. 364.)

Air Quality

Although the problem of air pollution has been recognized for a long time (in nuisance ordinances, for example) and the federal government began air quality programs in 1955, the management approach has, until quite recently, focused almost entirely on controlling the source of pollution. The federal air quality management program consists primarily of national standards for ambient concentrations of some specific pollutants (for example, SO_2) and of state implementation plans to meet the standards. Both elements have tended to focus on reducing the amount of emissions generated, in other words, controlling the source of air pollution. (See The National Air Quality Management Program, p. 370.)

However, certain provisions of the Clean Air Amendments of 1970 and recent plan implementation guidelines from EPA suggest that source control is not the only strategy to improving air quality and that a more comprehensive look at the problem, including relationships to land use planning is most important. It is now being formally recognized that air quality is closely related to land use patterns, proximity between generators and receptors, meteorological conditions, and economic growth and demands. For example, EPA is requiring that state implementation plans include projections of economic growth and analyses of "complex urban sources," such as shopping centers, highways, and utilities and their direct and indirect effects on air quality. (See The National Air Quality Management Program, p. 370.)

Because emissions are concentrated in urban areas, because air quality and land use planning are inextricably interrelated, and because local governments possess many powers of implementation, the local level element of air quality management can be very important. This will be particularly true in the near future if local and metropolitan planning agencies begin to incorporate air quality objectives and criteria into their planning programs and acquire the expertise to relate land use patterns and urban activity to air quality. (See The Necessity for Local Air Quality Management Programs, p. 376, and Local Planning for Air Quality Management, p. 378.)

It is clear that intergovernmental cooperation is necessary for successful air quality management. The federal government and state governments play vital roles in relation to uniform standards, strategy guidelines, financial and technical assistance, and enforcement. Within this framework, local governments can play equally important roles not only in terms of implementing specific regulations or enforcement procedures, but also in attacking the roots of the problem via comprehensive land use planning and guidance systems. Local efforts can be grouped under the following headings:

1. Advice Local monitoring and information programs and local or metropolitan review of new urban development plans and projects are included here. (See Local Planning for Air Quality Management, p. 380.)

2. Controls These include emission density regulations to dilute emissions; air zoning to prohibit certain polluting activities; special use permits to apply regulations beyond general zoning; and planned unit development regulations to provide open space and buffers. These controls are particularly dependent on informed local land use planning. (See Local Planning for Air Quality Management, p. 381.)

3. Inducements Differential property taxes, effluent or emission fees, land assembly programs, and utility extension policies are examples. (See Local Planning for Air Quality Management, p. 387.)

4. Developments These include provision of planned industrial parks and open space acquisition to isolate pollution generators and take advantage of natural assimilation capacities. Urban renewal can also be used to either eliminate pollution generators or improve spatial patterns. (See Local Planning for Air Quality Management, p. 388.)

The Current Mainstream in Local and Metropolitan Planning Agencies

Thus far we have focused on concepts and planning activities that might be termed "cutting edge." That is, the emphasis has been upon findings and recommendations in relation to new and improved planning principles and methods. In contrast, the next section describes, on the basis of a national survey of planning agencies, the "mainstream" or commonplace planning processes presently in practice throughout the country. The precise distinction between what is cutting edge and what is mainstream may not be completely clear in some cases; however, the dichotomy has been quite useful as a basic organizing principle in our research. (See Research Approach, p. 6.) In any case, a survey of current practice will define what we consider to be the mainstream.

Feeling that we could assess what is predominant practice only through direct communication with local planners, we undertook a mail survey of planning agencies. In September 1972, six hundred and two questionnaires were mailed to a random sample of local and metropolitan planning directors. The questionnaire was designed to obtain information and judgments about agency orientation to environmental planning and relative importance placed on environmental planning; influential factors in raising environmental issues at the local level; importance of environmental goals in various program areas; implementation practices and their effectiveness; and factors that aid or impede implementation of agency recommendations. Information on these topics was collected in a precoded format. The questionnaire also pursued the following questions in a more open-ended manner: the director's perception of the role of local government and its planning agencies in promoting environmental quality; the effect of regional, state, and federal legislation and organization on local government; and an assessment of such legislation and organization from the position of local government.

Our tight study schedule necessitated an early cutoff date so that only 185 returns, a 30 percent response, were in hand for coding and computerizing. Fifteen late returns were included in analyses of open-ended questions. The composition of responding agencies suggested a five-level classification, or stratification, for analysis: metropolitan regional agencies; metropolitan central city agencies; agencies from other municipalities in metropolitan areas; county agencies within metropolitan areas; and non-metropolitan city and county agencies.

The information obtained in this survey is definitely mainstream rather than the cutting edge, or innovative, techniques discussed in the rest of this report. Questionnaires and random samples cannot ferret out the relatively rare cutting edge innovations that are just beginning to appear.

The survey has three shortcomings. First, while excellent sample frames exist for metropolitan-regional and metropolitan-principal city agencies, no accurate nationwide sample frame of county and city planning directors could be found. Hence, the ASPO Planning Advisory Service mailing list was used. Second, the survey respondents probably represent agencies and directors more interested in planning for environmental quality than the group that did not respond. Third, since the data were provided by individuals, they are certain to reflect the particular respondent's attitudes and scope of knowledge about his agency's activities. However, given these cautions, our data should reasonably reflect current environmental consciousness and practice in local planning agencies.

Our analyses addressed four topics: general orientation, implementation influencing factors, and intergovernmental relations.

General Orientation While there is definitely a growing concern about environmental quality among local agencies, it is a recent phenomenon, tending to follow, not to lead, the general national environmental consciousness. Agencies tend to approach the issue by incorporating environmental quality goals into an already broad range of concerns--concerns which have the traditional bias toward urban values, comprehensiveness, and balance among multiple objectives--rather than by focusing on individual environmental problems. Also, problems of the manmade environment (noise, for example) apparently are not viewed as part of the overall environmental concern. Although many agencies are not setting up separate work programs in environmental planning, a few employ staff trained in environmental fields.

Implementation The most effective implementation devices are regulations and public investment, but few agencies suggested public investment as an appropriate role for local government. Specifically, burning ordinances, subdivision regulations (especially, for instance, provisions for burying utilities), planned unit development regulations, floodplain zoning, open space acquisition, and development of parks and recreation facilities were suggested as effective implementation methods. Information/advice devices, including the various review processes, appear to be considered generally ineffective, as are some regulatory devices often linked to environmental planning; for example, litter and noise ordinances, excavation controls, and large lot zoning incentives, pricing, and tax policies appear to be little used.

The land use plan, federal and state guidelines, and model codes are the common bases for determining implementation procedures. Special environmental studies are seldom used in formulating implementation instruments. We feel that our data suggest a need to develop strategies to encourage local agencies to utilize available environmental information in their determination of guidance instruments.

Influencing Factors Factors influencing introduction of environmental issues and those affecting implementation of agency recommendations are similar: staff attitudes, ideologies, and expertise; local groups--legislative body, interest groups, commissions and advisory boards; and higher level government--via federal and state guidelines, regulations, and funding. However, agency staff and local groups were listed as influencing factors far more often than higher level government. Furthermore, three local factors--governmental fragmentation, distribution of responsibility among agencies, and dispersal of financial resources--appear to have the greatest negative influence.

Environmental impact statements, crises, programs of other communities, and court action were all relatively unimportant influences on the local scene, according to our respondents. We had hypothesized that they would be significant and certainly expect them to increase in importance over the next few years.

Intergovernmental Relations Local agencies seem to feel that higher level government has a positive impact that is generally not as significant as local factors. It is interesting to note that HUD received the largest number of negative responses. Agencies are not satisfied with the intergovernmental framework and suggested changes, such as increased funds, stronger state enabling legislation, and more efficient coordination among governments, primarily at federal and state levels. Respondents defined local government's role as maintaining community awareness; implementing regional, state, and federal policies; and addressing environmental issues that do not extend across jurisdictional boundaries.

The overall view gained from this survey is one of considerable environmental concern but of only modest planning and implementation activity with indirect introduction of environmental goals into a broad range of traditional urban planning concerns. Local government is currently the weak link in the intergovernmental environmental policy framework mainly because it lacks technical capacity and is underutilized by higher levels of government. However, the findings suggest that local governments do have a strong sense of responsibility and would respond positively to further encouragement of greater participation in environmental planning. Any such approach must recognize, however, that local planning agencies are inclined to incorporate environmental quality goals into their planning models without changing other urban values or discarding a comprehensive approach to planning for multiple objectives. The survey revealed few radical suggestions for solutions and indicates that local planners are pragmatic and painfully aware of conflicting objectives and constraints. They are not likely to be receptive to a narrowly focused environmental sector planning and implementation strategy.

Conclusion

This concludes our summary of findings and recommendations. We hope that it has given the reader some indication of not only the present state of local planning for environmental quality, but also the great need and potential for a much stronger local input to overall environmental management. It is this need and potential that is the focus of the report.

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APPENDIX

SURVEY FORM for Determining Current Urban Planning Practices and Land Use Controls for Promoting Environmental Quality.

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CENTER FOR URBAN AND REGIONAL STUDIES
THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

A SURVEY OF
CURRENT URBAN PLANNING PRACTICES AND LAND USE CONTROLS
FOR PROMOTING ENVIRONMENTAL QUALITY

Information provided by:

Director's Name ____________________

Agency ____________________

City ____________________

State ____________________ Zip __________

We have attempted to ask questions in this questionnaire that can be answered simply and quickly. However, in some cases if you want to answer in more detail, please do so. In addition, we would appreciate receiving any reports, memos, ordinances, etc. that relate to any of the questions or that describe your environmental planning efforts in general.

If you desire to be informed of the results of the survey, please check this box. ☐

108 Battle Lane Chapel Hill, N. C. 27514 Telephone 919-933-8074

1. GENERAL ORIENTATION TO ENVIRONMENTAL PLANNING IN YOUR AGENCY

1.1 Which one of the following phrases best expresses your agency's view of environmental planning?

☐ Provision of anti-pollution systems and controls
☐ Designing urban environments for human use
☐ Integrating man-made and natural systems
☐ Protecting natural eco-systems

1.2 From your agency's point of view, how important are environmental problems in your agency's jurisdiction?

1960's	Present	
☐	☐	our most critical problem
☐	☐	critical, but not most important
☐	☐	important, but not critical
☐	☐	relatively unimportant

Please specify the more critical urban problems at present:

____

____

2. PLANNING PROGRAM AREAS AND ENVIRONMENTAL QUALITY

2.1 For each program area, check those influences which have been most important in raising environmental issues.

PROGRAM AREAS / INFLUENCES	local special interest groups	advisory groups	local commissions	local legislative bodies	public opinion	media exposure	natural catastrophes/crises	local crises	professional colleagues	federal/state guidelines or reg.	environmental impact statements	federal/state incentives	law suits and other court actions	programs in other communities	professional/scientific literature	staff attitudes and ideologies	feedback from previous projects	environmental monitoring	consultants inputs	others (specify)	
land use																					☐
open space/recreation																					☐
transportation																					☐
housing																					☐
water and sewer, including treatment																					☐
other utilities (i.e. power)																					☐
air quality																					☐
noise																					☐
solid waste management																					☐
redevelopmant																					☐
design and appearance																					☐
historic preservation																					☐
industrial development																					☐
other (specify)																					☐

2.2 Has your agency established "Environmental Planning" as a distinct work activity? ☐ NO (Go to next page) ☐ YES (Check the program areas included in the activity "Environmental Planning.")

2.3 For those program areas in which your agency is engaged, circle the degree of importance of the goal of environmental quality to the program.

CIRCLE IMPORTANCE OF ENVIRONMENTAL QUALITY......

CIRCLE WHETHER YOUR AGENCY IS ENGAGED? ......

PROGRAM AREAS	engaged	not engaged	very important	moderately important	slightly important	not important
land use	1	2	1	2	3	4
open space/ recreation	1	2	1	2	3	4
transportation	1	2	1	2	3	4
housing	1	2	1	2	3	4
water and sewer, including treatment	1	2	1	2	3	4
other utilities (i.e. power)	1	2	1	2	3	4
air quality	1	2	1	2	3	4
noise	1	2	1	2	3	4
solid waste management	1	2	1	2	3	4
redevelopment	1	2	1	2	3	4
design and appearance	1	2	1	2	3	4
historic preservation	1	2	1	2	3	4
industrial development	1	2	1	2	3	4
other (specify)	1	2	1	2	3	4

2.4 For those program areas in Question 2.3 above which received a rank of 1, 2, or 3, check the most important specific environmental objective.

SPECIFIC OBJECTIVES

PROGRAM AREAS	safety	health	amenity	aesthetics	preservation of natural processes	preservation of cultural resources	prevent physical deterioration
land use							
open space/receation							
transportation							
housing							
water and sewer, including treatment							
other utilities (i.e. power)							
air quality							
noise							
solid waste							
redevelopment							
design and appearance							
historic preservation							
industrial development							
other (specify)							

3. IMPLEMENTATION OF ENVIRONMENTAL QUALITY OBJECTIVES

In addition to planning program areas, implementation devices, strategies and problems are important concerns in the pursuit of environmental quality objectives. This section of the questionnaire deals with the range of controls, incentives, and other devices used by your local government, sources of information and studies used in their formulation, their effectiveness in achieving environmental quality and factors affecting their implementation.

3.1 Of the following controls, circle those used by your local government. Next, if a control is used, circle its degree of effectiveness in achieving environmental quality objectives. Finally, check those sources of information or studies directly used in determining the substance of the controls.

Part 3: CHECK STUDIES AND SOURCES OF INFO. USED.....

Part 2: IF USED, CIRCLE EFFECTIVENESS IN ACHIEVING ENVIRONMENTAL QUALITY...

Part1: DO YOU USE? CIRCLE ANSWER.....

CONTROLS	used	not used	very effective	moderately effective	slightly effective	not effective	federal/state guidelines	state and regional plans	soil and geologic studies	flood plain studies	visual surveys	deterioration mapping	ecological studies	environmental impact studies	monitoring programs	model codes	river basin studies	cultural resource studies	comprehensive envir. studies	general land use plan	urban design studies	others (specify)
general zoning ordinance	1	2	1	2	3	4																
density zoning (specify)	1	2	1	2	3	4																
agricultural zoning	1	2	1	2	3	4																
large lot zoning (2+ acres)	1	2	1	2	3	4																
special district zoning	1	2	1	2	3	4																
flood plain	1	2	1	2	3	4																
historic	1	2	1	2	3	4																
ecologic	1	2	1	2	3	4																
geologic	1	2	1	2	3	4																
planned unit development	1	2	1	2	3	4																
special use/variance	1	2	1	2	3	4																
building ordinance	1	2	1	2	3	4																
preformance standards	1	2	1	2	3	4																
housing codes	1	2	1	2	3	4																
subdivision regulations	1	2	1	2	3	4																
public water and sewer	1	2	1	2	3	4																
dedication of open space	1	2	1	2	3	4																
preservation of trees	1	2	1	2	3	4																
burying of utility lines	1	2	1	2	3	4																
burning ordinance	1	2	1	2	3	4																
emissions ordinance	1	2	1	2	3	4																
effluent ordinance	1	2	1	2	3	4																
noise ordinance	1	2	1	2	3	4																
litter ordinance	1	2	1	2	3	4																
health/sanitation ordinance	1	2	1	2	3	4																
appearance ordinance	1	2	1	2	3	4																
sign ordinance	1	2	1	2	3	4																
tree ordinance	1	2	1	2	3	4																
historic preservation controls	1	2	1	2	3	4																
excavation controls	1	2	1	2	3	4																
sedimentation/erosion controls	1	2	1	2	3	4																
marshland controls	1	2	1	2	3	4																
conservation easements	1	2	1	2	3	4																
utility and other easements	1	2	1	2	3	4																
others (specify)	1	2	1	2	3	4																

3.2 Of the following incentive devices, circle those used by your local government. Next, if an incentive device is used, circle its degree of effectiveness in achieving environmental quality objectives. Finally, check those sources of information or studies directly used in determining the substance of the incentive devices.

Part 3: CHECK STUDIES AND SOURCES OF INFO. USED....

Part 2: IF USED, CIRCLE EFFECTIVENESS IN ACHIEVING ENVIRONMENTAL QUALITY...

Part 1: DO YOU USE? CIRCLE ANSWER...

INCENTIVES	used	not used	very effective	moderately effective	slightly effective	not effective	federal/state guidelines	state and regional plans	soil and geologic studies	flood plain studies	visual surveys	deterioration mapping	ecological studies	environmental impact studies	monitoring programs	model codes	river basin studies	cultural resource studies	comprehensive envir. studies	general land use plan	urban design studies	others (specify)
bonus clauses in zoning	1	2	1	2	3	4																
differential property tax	1	2	1	2	3	4																
differential utility charges	1	2	1	2	3	4																
compensatory payments	1	2	1	2	3	4																
utility extension policies	1	2	1	2	3	4																
others (specify)	1	2	1	2	3	4																

3.3 Of the following capital investments, circle those used by your local government. Next, if used circle its degree of effectiveness in achieving environmental quality objectives. Finally, check those sources of information or studies used in making determinations about capital investments.

Part 3: CHECK STUDIES AND SOURCES OF INFO. USED......

Part 2: IF USED, CIRCLE EFFECTIVENESS IN ACHIEVING ENVIRONMENTAL QUALITY.....

Part 1: DO YOU USE? CIRCLE ANSWER.....

CAPITAL INVESTMENTS	used	not used	very effective	moderately effective	slightly effective	not effective	federal/state guidelines	state and regional plans	soil and geologic studies	flood plain studies	visual surveys	deterioration mapping	ecological studies	environmental impact studies	monitoring programs	model codes	river basin studies	cultural resource studies	comprehensive envir. studies	general land use plan	urban design studies	others (specify)
open space acquisition	1	2	1	2	3	4																
parks and recreation facilities	1	2	1	2	3	4																
water supply development	1	2	1	2	3	4																
sewer and waste water treatment	1	2	1	2	3	4																
solid waste management	1	2	1	2	3	4																
other utilities	1	2	1	2	3	4																
highways and public trans	1	2	1	2	3	4																
renewal projects	1	2	1	2	3	4																
other public facilities	1	2	1	2	3	4																

3.4 Of the following channels of information, circle those used by your agency to implement environmental quality objectives and, if used, circle the degree of effectiveness.

Part 2: IF USED, CIRCLE DEGREE OF EFFECTIVENESS IN ACHIEVING ENVIRONMENTAL QUALITY.......

Part 1: DO YOU USE? CIRCLE ANSWER.........

CHANNELS OF INFORMATION	used	not used	very effective	moderately effective	slightly effective	not effective
disseminating reports	1	2	1	2	3	4
citizen education programs	1	2	1	2	3	4
mass media	1	2	1	2	3	4
inter-agency coordination	1	2	1	2	3	4
advisory review functions	1	2	1	2	3	4
environmental impact statements	1	2	1	2	3	4
informal review	1	2	1	2	3	4
citizen participation	1	2	1	2	3	4
A-95 review	1	2	1	2	3	4
other (specify)	1	2	1	2	3	4

3.5 Circle the degree of impact of the following factors on the implementation of your agency's recommendations for achieving environmental quality objectives.

CIRCLE DEGREE OF IMPACT ON IMPLEMENTATION....

FACTORS	strong positive impact	positive impact	no impact	negative impact	strong negative impact
local legislative body	1	2	3	4	5
lay commissions	1	2	3	4	5
line agencies	1	2	3	4	5
neighboring municipalities and other governments	1	2	3	4	5
community leadership support	1	2	3	4	5
general citizen support	1	2	3	4	5
local financial resources	1	2	3	4	5
federal and state financial support	1	2	3	4	5
staff expertise	1	2	3	4	5
status of planning methodologies	1	2	3	4	5
"public" environmental interest groups	1	2	3	4	5
other special interest groups	1	2	3	4	5
community goals other then environmental quality	1	2	3	4	5
federal/state guidelines and regulations	1	2	3	4	5
distribution of responsibility among local governments	1	2	3	4	5
distribution of responsibility among agencies within local govt.	1	2	3	4	5
state enabling legislation	1	2	3	4	5
federal,state,and regional planning assistance	1	2	3	4	5
federal programs and policies other than environmental	1	2	3	4	5
federal and state requirements for environmental impact statements	1	2	3	4	5
trends in legal actions and court decisions	1	2	3	4	5

4. INTERGOVERNMENTAL RELATIONS IN ENVIRONMENTAL PLANNING AND IMPLEMENTATION

Local government, of course, must function within a framework of regional, state, and federal legislation and organization. In this section we would like to obtain your judgment about the effect of this governmental framework on your planning and implementation of environmental quality objectives.

4.1 Which federal legislation and organizational or administrative changes have had the most significant effect, positive or negative, on your agency's planning and/or implementation of environmental quality objectives? Describe the nature of the effects.

4.2 What, if any, state legislation and organizational or administrative changes have significantly affected your agency's planning and/or implementation of environmental quality objectives, either positively or negatively? Describe the nature of the effects.

4.3 What, if any, regional, metropolitan, or local legislation and organizational or administrative changes have significantly affected your agency's planning and/or implementation of environmental quality objectives, either positively or negatively? Describe the nature of the effects.

4.4 What does your agency see as the role of local government and its planning agencies in promoting environmental quality?

4.5 Can environmental problems in your community be handled satisfactorily within the existing framework of federal and state environmental quality legislation, policies and activities or are further changes required at these higher levels? If so, what should the changes be?

5. NEW IDEAS

5.1 Has your agency developed or used any new planning methods, studies, or guidance tools (i.e., information channels, controls, incentives, or capital investments) to promote environmental quality? Please describe.

5.2 Does your agency have any plans, programs, or general ideas for promoting environmental quality which you are unable to pursue for some reason? Please describe the ideas and the obstacles.

5.3 If there are any aspects of your pursuit of environmental quality which are not covered by the questionnaire, we would appreciate additional comments.

5. GENERAL INFORMATION

To help us analyze the responses from the questionnaire sample, we would li just a few items of general information about your agency:

6.1 Number of Planners ____

6.2 Number of personnel with degrees in environmental fields:

___Environmental Science/Engineering ___Ecology/Natural Sciences
___Architecture/Urban Design ___Landscape Architecture
___Environmental Planning ___Environmental Healths
___Others (specify)____

6.3 Please try to classify your "agency type" by checking the appropriate characterization.

☐ Local City Agency (1 single municipality)
☐ Local County Agency (1 single county jurisdiction)
☐ Metropolitan Agency (jurisdiction of principal city, regardless of size, plus one or more cities or counties)
☐ Regional Agency (multi-county jurisdiction)
☐ Other (specify)____